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VIEWS, NEWS AND INTERVIEWS.

An ingenious method of regulating the vacuum in a Crookes tube in order to obtain the best conditions for X-ray work has been brought forward by M. P. Villard, says a British exchange. To his tube he fixes a platinum branch. This metal, like palladium, has the property of being pervious to hydrogen at a red heat. Hence to lower the vacuum it is simply sufficient to heat this platinum branch in the flame of a Bunsen burner, when a certain proportion of the hydrogen of the coal gas will pass through the platinum into the tube. To improve the vacuum a similar procedure is followed, but in this case the platinum is protected from direct contact with the flame by means of a metal muffle.

Rear-Admiral Sampson one day last week drove from his home at Glen Ridge, N. J., with a friend to West Orange, where he had an appointment with Thomas A. Edison. The latter escorted the admiral through the laboratory and phonograph works, showing him some of his late inventions.

Colonel Lusk, chief of the engineer corps at Camp Meade, has been working so hard that he has succumbed at last, and is now in the Harrisburg, Pa., hospital undergoing treatment for nervous prostration. The other day Colonel Ives, chief of the signal corps, called at the hospital to see his brother officer. He was looking so bad himself that Colonel Lusk advised him to remain and be cared for. He returned to camp, however, and later was brought to the hospital. He is threatened with typhoid fever. Colonel Ives recently returned from duty in Porto Rico and has been hard at work since coming to Camp Meade.

The plans submitted to Bridge Commissioner John L. Shea by the engineers of the various railroad companies for increased facilities at the Brooklyn terminal of the Brooklyn Bridge have been rejected on the ground that they would narrow Washington street at the bridge entrance and would make the entrance unsightly. He has not yet considered the plans for the additional loops on the New York side of the bridge.

The great Boston subway has been finished and inspected. The total length is about one and one-third miles and the total length of single track five miles. It has been constructed well within the original appropriation of $5,000,000, and forms the first step in Boston's comprehensive rapid transit system, which includes a tunnel underneath the harbor to East Boston and elevated lines connecting with the subway.

The following letter is word for word as our London namesake received it, the name and address only of the writer being withheld: "Dear Sir,—Would you kindly give me the following information, I am desirous of entering the Electrical Engineering Proffesion either as Central Station or Consulting, I have a fair knolage of the Theory, but desire a Good Practical Training, could you recomend any College for this Purpose, if not an apprenticeship at a Works for a small Preinem. I am 21 years of age, but have a decided interest in the Work, I have no knolage of Mathematics at Present but would start at once, if you would advise me to procede. I am not at present in an Engineering Trade. Would you advise me to procede. I am Willing to give 3 to 5 years in the attempt. Thanking You in Anticipation I remainn Your in Earnest, —— ——."

ALBION E. LANG, OF TOLEDO, OHIO, PRESIDENT AMERICAN STREET RAILWAY ASSOCIATION.

BOSTON'S STREET RAILWAY CONVENTION.

The Advocates of Rapid Transit in Session This Week at the Hub.

THE PRACTICAL AND TECHNICAL MEN, COURIERS OF THE TRANSPORTATION MILLENNIUM, GATHER IN BOSTON FROM ALL PARTS OF THE UNITED STATES—THE FIRST DAY'S SESSION FULL OF SNAP AND INTEREST—AN INTERESTING EXHIBITION OF ELECTRICAL APPARATUS—GENEROUS ENTERTAINMENT BY HOSPITABLE BOSTON—THE CONVENTION TO CONTINUE UNTIL FRIDAY — THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION ALSO IN SESSION—DESCRIPTION OF SEVERAL EXHIBITS.

The seventeenth annual convention of the American Street Railway Association is being held in the city of Boston this week. This is the second time the organization has come together at the Hub, although the first meeting, held in 1882, was for the purpose of effecting an organization. The association has made a pretty wide circle since its organization, having visited, among others, the cities of Chicago, New York, St. Louis, Atlanta, Montreal, Pittsburgh, and last year Niagara Falls. The association has been a very influential and successful one, and has attracted to its membership the leading men connected with street railway transportation and electric power for traction purposes.

The delegates and visitors to the convention began arriving the latter part of last week, quite a number coming in advance to arrange for exhibits in the exhibition hall of the Massachusetts Charitable and Mechanics' Association. The business sessions of both the American Street Railway Association and the Accountants' Association are being held on the second floor over the exhibi-

tion. The Street Railway sessions are held in what is called the Paul Revere Hall, and the Accountants' Association are held in the banquet room.

THE CONVENTION IN SESSION.

BOSTON, SEPTEMBER 7—In her strikingly characteristic, methodical way—a way of doing things which one only finds within the confines of New England—Boston has taken up the arrangements for the meeting of the American Street Railway Association, so that on the first two days the great exhibition hall is really in order, the street railway delegates and the hundreds of representatives of the street railway manufacturing interests have been registered, numbered, given buttons for free car rides, formally invited to join in sundry banquets, excursions, clambakes, shopping tours, inspection of cemeteries, and to accept the "glad hand" in a most general way.

The location of the exhibition building, Mechanics' Hall, a few moments' walk from the headquarters at the Hotel Brunswick, is admirable. The building is well adapted for the exposition of street railway equipments, because of the great size, quite three times as large as the barracks constructed last year at Niagara Falls; its nearness to the railroad, being directly back of the tracks of the New York, New Haven & Hartford Railroad, and the large and cheerful basement on the ground level into which street cars and heavy machinery have been put with little effort.

Though the Hotel Brunswick, which has been selected as the official headquarters, has been well filled, there has been a tendency among the visitors to spread among the other hotels, so that the corridors of Young's, Parker's, Tourraine, Thorndyke, Copley Square and others are pretty well filled with men of street railway interests.

The ELECTRICAL REVIEW has been asked to announce that room 48, Hotel Brunswick, is the general committee room or headquarters of the Massachusetts Street Railway Association, and room 24, Hotel Brunswick, is the headquarters of the ladies' committee.

Also the ELECTRICAL REVIEW has been asked to make the following announcement for the convenience of delegates:

MECHANICS BUILDING,
BOSTON, September 6, 1898.

TO THE DELEGATES AND SUPPLY MEN.

GENTLEMEN: We take this means of notifying you that a "Bureau of Information" has been established in this building for the comfort and convenience of all who attend the convention. There will be a private telephone, an expert stenographer, writing material, a post office where letters may be left and received, etc.

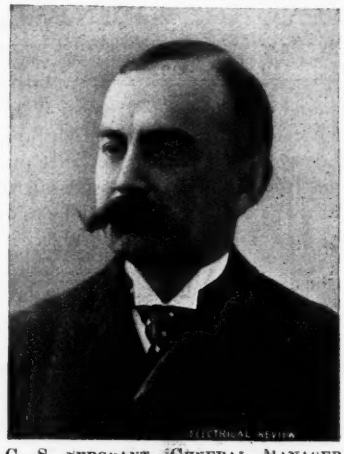
It is quite important that all delegates and supply men leave their card at this place, noting on the back their Boston address during the convention, in order that the representative of this bureau may be enabled to locate them should any of their friends call. By doing so, it will not only prove of assistance to you, but all others who may attend the convention.

It is important that all applications for tickets for trip to Lexington and Concord be made at this department before ten o'clock, A. M., on Tuesday. Tickets for the trip to Plymouth on Thursday afternoon may be obtained on and after Wednesday morning.

Yours respectfully,
ROBERT H. DERRAH,
In charge of Bureau of Information.

THE FIRST DAY'S PROCEEDINGS.

Just a little after 10 A. M. Tuesday the first session was called to order by president Albion E. Lang. The attendance far exceeded that of any meeting previously held. The gentlemen present were the most representative body of street railway men which could be gotten together. Men from California, Texas, Utah and nearly every state in the Union were on hand. After the roll-call President Lang traced the history of the association from its birth, and spoke of its prosperous condition at the present time. After reports from the executive committee and the secretary and treasurer had been presented, Mr. Richard McCullough, of the Citizen's Street Railway Company, of St. Louis, read a paper which created considerable interest. The paper was on "Comparative Earnings and Economy of Operation Between Single and Double Truck Cars for City Use." The reading of the paper on "Municipal Ownership of Street Railways" was postponed until next year.



C. S. SERGEANT, GENERAL MANAGER WEST END STREET RAILWAY COMPANY, BOSTON.

Tuesday afternoon a party of ladies and gentlemen enjoyed an excursion to historic Concord and Lexington, and in the evening the ladies' entertainment committee received at Paul Revere Hall from 8 o'clock until 11. The social side of this meeting apparently is quite a success, as the visitors all speak in pleasant terms of Boston hospitality.

T. C. PENINGTON, OF CHICAGO, SECRETARY AMERICAN STREET RAILWAY ASSOCIATION.

CONVENTION NOTES.

The Standard Air Brake Company, of New York, are exhibiting a number of the new geared axle-driven compressors in operation during the session of the convention. They are installed on the Commonwealth Avenue line. This is the line over which the visitors were carried when visiting Norumbega Park on Wednesday. The New England representatives of this company, Messrs. Pettee and McCutcham, are at the car barns to exhibit the brake in detail and furnish information. The improved features of the device, which are being shown by practical demonstration, are the following: The compressor is in operation only when needed to supply air; the machine is self-contained, all parts operating in a bath of oil; maximum pressure maintained for each and every stop; the average power required will not exceed one-eighth horse-power; piping reduced to the minimum; few parts and so constructed that the cost of maintenance will be nominal.

The Sterling Supply and Manufacturing Company, 141–155 East 25th street, New York, have just prepared for distribution a well illustrated catalogue, with heavy flexible covers, descriptive of the street railway specialties made in their shops. Among some of the products described are the several types of the "Sterling" fare registers and connections, safety brakes, car fenders, sand boxes, strain insulators and suspension devices, and many sundries used in street railway equipment. The patrons of this company include some of the largest and most exacting street railroads in America, such as the Metropolitan system of New York.

The General Electric Company was well represented at Boston both by engineers and agents. The exhibit is interesting and novel. The company's headquarters were at the Brunswick Hotel, with a reception room on the first floor, whither all delegates were made warmly welcome. Advantage was taken of the fact that Boston is distinctly a General Electric center to arrange a series of visits to different stations where General Electric apparatus was to be seen in commercial operation, and to illustrate the history of rapid transit and the actual development of the electric railway. The proximity of the Lynn works of the company afforded the delegates an opportunity of visiting them and of appreciating the excellence of the methods employed in the construction of railway apparatus. Much new literature by the General Electric press was distributed at the convention, and was found by delegates at Mechanics' Hall and at the company's headquarters. To Mr. W. J. Clark, general manager of the railway department, the interests of the General Electric Company were confided. He was assisted by the following representatives: Boston, Mass., C. C. Pierce, F. M. Kimball, Percy Hodges, C. D. Haskins; Lynn, Mass., W. D. Fish; Schenectady, N. Y., W. B. Potter, F. E. Case, H. C. Wirt, W. G. Carey; New York, N. Y., R. H. Beach and J. J.

Mahoney; New Haven, Ct., W. G. Bushnell; Philadelphia, Pa., H. J. Crowley; Baltimore, Md., A. F. Babson; Chicago, Ill., Theo. P. Bailey; St. Louis, Mo., Geo. D. Rosenthal; Cincinnati, Ohio, F. H. Strieby; San Francisco, Cal., F. F. Barbour; Atlanta, Ga., S. W. Trawick.

The Walker Company are exhibiting railway motors chiefly. The company have a complete exhibit of the new Walker railway motor No 33–S, including motor open, motor closed; four armatures in various stages of winding, and a set of small parts handsomely mounted on a large panel; a standard railway switchboard panel; the underground "Love" conduit system shown in New York last Spring; 15 "L" motors of the type now in use on the Brooklyn Elevated road; two controllers of the solenoid, blow-out type, the action of the solenoid being clearly shown by a device mounted on the controller platform; also several of the well known Walker arc lamps are shown. The following gentlemen representing the Walker Company are present:

S. H. Short, H. McL. Harding, Chas. L. Black, J. S. Anthony, C. D. Barton, H. G. Issertel, R. A. Byrnes, J. D. Moore, M. D. Law, J. Dodd, Mr. Sawyer.

The huge globe of the world, reaching nearly to the high ceiling and lighted by small electric lamps, erected by the General Electric Company, is the feature in the way of spectacular exhibits. The different countries of the world have been mapped and indicated by all the national flags, and wherever the General Electric Company's railway equipments are in use a lamp is lighted. It is needless to say that the lamps are on all parts of the globe. The General Electric Company are said to have in operation at the present time 52,841 railway motors.

Mr. J. S. Speer, secretary of the Partridge Carbon Company, Sandusky, Ohio, is one of the gentlemen from Ohio present.

The excellent showing made by the Keystone Electrical Instrument Company, of Philadelphia, is of great interest to expert electricians. The exhibition included many types of the "Keystone" measuring instruments, which are now adopted as standard by a large number of street railway and power houses. The instruments are handsomely mounted, and are exhibited in conjunction with the New York agent, Mr. Elmer P. Morris.

The Billing & Spencer Company, Hartford, makers of drop-forge commutator bars and street railway specialties, are represented by Messrs. H. E. Billings and Post.

The Electric Storage Battery Company, Philadelphia and New York, are represented by Messrs. Chas. Blizard, Woodbridge and Stone.

The Jno. Stephenson Company, New York, have several handsome models of modern street cars on view. Messrs. D. W. Pugh and Henry Wood are present for the company.

The J. G. Brill Company are as usual represented by an able staff of men and an elaborate exposition of all forms of street cars and equipments.

The Adams & Westlake Company, Chicago, have half a section of a full-size street car fitted up to show the operation of the "Acme" car curtains.

Among the many who are registered at the various hotels during the convention the following names of gentlemen well known in the street railway field are to be found: J. A Rutherford, the Johnson Company, Cleveland, Ohio; Chas. A. Bragg, Philadelphia; A. H. Gray, the Peckham Truck and Motor Company, Chicago; Jno. T. McRoy, Chicago; G. O. Naugle, of Naugle & Holcomb, Chicago; Robt. McCullough, ex-president of the association, St. Louis; T. C. Penington, secretary, Chicago; W. J. Clark, manager railway department General Electric Company, New York; Jno. A. Brill, Philadelphia; W. S. Eckert, Safety Insulated Wire Company, New York; F. W. Darlington, Philadelphia; Harold P. Brown, New York; W. Caryl Ely, Niagara Falls; Geo. A. McKinlock, president Central Electric Company, Chicago; Arthur S. Partridge, St. Louis; Hon. Robt. Fessenden, Hope Electric Appliance Company, Providence; Messrs. Gold, Banks, Ward and Beach, of the Gold Street Car Heating Company, New York; R. J. Randolph, Sterling Arc Lamp Company, New York; Messrs. W. R. Cockey, W. L. Doyle, of Jno. Roebling's Sons Company, Trenton; Luther Steiringer, New York; Elmer P. Morris, New York; J. F. Stevens, Keystone Electrical Instrument Company, Philadelphia; S. B. Condit, Jr., L. A. Chase & Company, Boston; E. R. Harding, Chicago Rheostat Company; S. H. Goddard, ELECTRICAL REVIEW; Henry Daily, the Jos. Dixon Crucible Company, Jersey City; J. W. Dunn and Chas. Bibber, Bibber–White Company, Boston.

The Westinghouse Electric and Manufacturing Company are well represented by the following large staff of gentlemen: Messrs. F. H. Taylor, general sales manager, Loring Truly, T. H. Murdock, E. W. P. Gray, Pittsburgh; Chas. A. Bragg, Philadelphia; Morris Cosker, E. W. Requister, Chicago; Wm. Zimmerman, general eastern sales agent, F. B. H. Payne, W. K. Archibald, New York; Paul T. Brady, Syracuse; C. H. Frenger, Buffalo; C. Tomley, R. F. Brown, H. A. Farnsworth, Boston. It is also thought by some of the gentlemen of the company that Mr. Geo. Westinghouse and Mr. D. H. Warren may make a brief visit during the meeting.

The Westinghouse exhibit, on the main floor quite near the entrance, is of great interest to the practical men who are following the development of electric street railway machinery. Aside from the complete series of all the patterns of street-car motors made in the Westinghouse shops, a rotary transformer is kept in operation and a complete system of automatic circuit-breakers and switches are operated. A feature of the Westinghouse exhibition, which appeals to the popular eye, is the flashing by X rays of the words, "The name of Westinghouse is a guarantee."

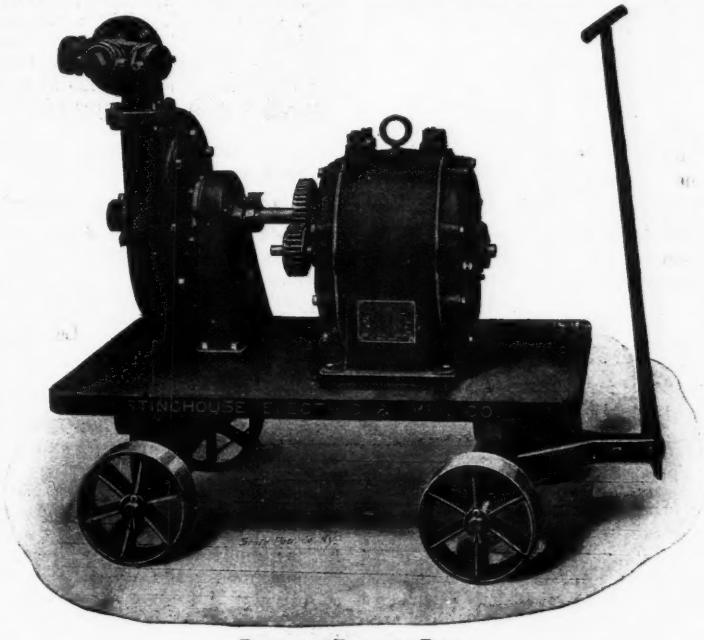
The H. W. Johns Company, of New York, have an artistic display of the standard overhead trolley line equipments, which are so favorably known by street railway constructors, and also many forms of the electric car heaters which they manufacture. Messrs. Dixon, Meek, Hatch, Luscomb, Perry and Spaulding are to be found either at the company's booth in Mechanics' Hall or at Copley Square Hotel, near the building.

These gentlemen of the New Haven Car Register Company are present from New Haven: Messrs. F. C. Boyd, Willis Anthony and Treasurer Bradley.

Mr. John M. High, who has become well known in the railway field through the introduction of "Pantasote," used for curtains and car upholstery, was one of the first arrivals.

Almost at the entrance the Sampson Cordage Works, Boston, have placed a case showing their products of arc light and trolley cords.

Prominently located on the main aisle of the first floor the Pettingell–Andrews Company have a splendid showing of street railway supplies of every character. Conspicuous among this display are the "Okonite" feeder wires and cables.



PORTABLE ELECTRIC PUMP.

Portable Electric Pumps.

The varied applications of electric power are no more strikingly illustrated than in the subject of this article. While the combination has been especially designed to be used in the California Winery, of Sacramento, Cal., it is one that may be applied to various other purposes.

The outfit consists of a Westinghouse Electric and Manufacturing Company's type "G" alternating-current induction motor of two-horse-power capacity direct-connected to a centrifugal pump. The machines are mounted upon a suitable truck, by which they are transferred from place to place in the operation of pumping wine from one vat to another. Receptacles for electrical connection are provided at convenient points throughout the winery, and the motor is connected by means of flexible cable to the circuit of the Central California Electric Company, whose power is generated at New Castle, 30 miles distant from Sacramento.

The simplicity of both pump and motor render them ideal in construction. The motor has neither commutator nor brushes, and there is no connection between the revolving part and the electric circuit. Beyond the occasional oiling of the bearings, no further attention is required over long periods of operation, and it may be handled by the most inexperienced persons with perfect safety.

The centrifugal pump is peculiarly adapted to handle liquids of whatever nature. It is capable of pumping under the most difficult conditions, and will handle hot or cold liquids successfully, even though they contain from 20 to 40 per cent of solids. Thus it will be seen that the applicability of the device extends beyond the luxuries of life, as in the pumping of wine, beer or other spirits, to the more arduous duty of pumping the dirty and muddy accumulations in electric subway manholes, tannery liquids, dyes, bleaching solutions, vinegar and brine liquids used in pickling, and, in fact, is applicable to a multitude of services in the arts and manufactures in which it is destined to be a permanent economic feature.

Lodge's System of Syntonized Wireless Telegraphy.*

That the Marconi system of wireless telegraphy has achieved considerable practical success is well known to readers of the ELECTRICAL REVIEW. Messages have been sent over a distance of 16 miles, and printed in dot and dash on the Morse ribbon. The number of words per minute transmitted has not been very great when compared with the speed of the ordinary line wire, but there are many exceptional circumstances in which that drawback may be more than counterbalanced by the several advantages of the Marconi system.

One thing, however, the Marconi system has yet failed to do; that is, to transmit messages which will only be recorded by a single selected receiver. In the early days of the Marconi system there was much talk about this being done, by taking advantage of the principle of resonance, but it has been found that in practice this principle can not be utilized by the Marconi apparatus. The theoretical conditions under which synchronism or syntony can be made effective in telegraphy by electric waves have been thoroughly investigated by Dr. Lodge, and the results of his investigations have been embodied in practical form in a system of apparatus which we are now able to describe in detail.

In Lodge's invention the method of intercommunication consists in utilizing certain processes and apparatus for the purpose of producing and detecting a sufficiently prolonged series of rapid electric oscillations, and in so arranging them, that the excitation of a particular frequency of oscillation at the sending station may cause a telegraphic instrument to respond at a distant station, by reason of being associated through a relay with a subsidiary circuit capable of electric oscillations of that same particular frequency, or of some multiple or sub-multiple of that frequency. Other distant stations will similarly be caused to receive messages by exciting at the sending station alternations of different frequency. Individual messages can thus be transmitted to individual stations without disturbing the receiving appliances at other stations which are tuned, timed or syntonized to a different frequency. Each station is usually provided with both sending and receiving apparatus.

A complete system of Hertzian wave telegraphy may be said to consist, in its simplest form, of an arrangement shown diagrammatically in Fig. 1, where A represents the emitting apparatus, and B the receiving apparatus. In the emitter illustrated in Fig. 1, electricity from a suitable source, such as a Ruhmkorff coil a, is supplied to a pair of conductors, which discharge into each other from knobs b and c, and thus excite oscillations, which emit one or two waves before they are damped out.

The receiving circuit consists essentially of a collector d, a coherer e, a battery f, or other suitable source of current, and a telegraphic receiving instrument g, all in electrical connection as shown.

In Lodge's system is a definite radiator consisting of a conductor or pair of conductors (represented by the letters h h^1 in Fig. 2 and following figures). These conductors are of large capacity, and may be arranged either as a Leyden jar, or preferably spread out separately in space (one of them being the earth when desired). To h and h^1 respectively are joined a pair of polished knobs h^2 h^3 (protected by glass from ultra-violet light), which form the adjustable spark gap called the "discharge gap." Between either capacity area and its knob is placed a self-inductance coil; i. e., a coil of wire or metallic ribbon h^4, preferably insulated with any solid or fluid insulator, as in Fig. 2, or in air, and of a shape suitable to attain the greatest induction with a given amount of resistance. The object of this coil is to prolong the electric oscillations occurring in the radiator, and so constitute a radiator of definite frequency or pitch, emitting a succession of true waves. This renders syntony in a receiver possible, because the exactitude of the response depends on the fact that the total number of oscillations in a suitably-arranged circuit is very great, so that a very feeble impulse is gradually strengthened till it causes a perceptible effect on the well known principle of sympathetic resonance.

The electricity is supplied to the radiator by a Ruhmkorff coil, a Tesla coil, or an influence machine, in one of three different ways, according to circumstances.

The first way is by leading wires from the machine to the two discharge knobs h^2 h^3, which gives a discharge which follows on a fairly steady electric strain.

The second way consists as shown in Fig. 3, in having a supplementary pair of spark gaps h^6 h^7 (which are called "supply gaps"), one knob of each (called the receiving knob) being attached to the middle or other convenient point of each capacity area h h^1, and the other knob of each pair (called the supply knob) being connected by wires h^8 to the Ruhmkorff coil a, and brought moderately near the first, so that when the coil is in action the capacity areas shall receive their positive and negative charges by aerial disruption; that is, in a sudden manner, rather than by the slower process of metallic conduction. They are then left to discharge into each other through the connecting coil h^4 and across the short spark gap between the knobs h^2 h^3. The best width of this gap depends on circumstances, and it may be closed altogether without stopping the action. The gap between the knobs h^2 h^3, may, if desired, be closed by a shunt h^9.

On the third plan, as indicated in Fig. 4, a Leyden jar or other suitable condenser j is intercalated in each of the wires h^8, leading from the coil a to the supply knobs, so that the knobs are supplied from the outer; that is, the uninsulated coat of each jar, while between the inner coats or coil terminals, a third spark gap, called the starting gap, also consisting of two knobs h^{10} h^{11}, is arranged. The outer coats of the jars must not be insulated from each other; they are usually joined by a self-inductance coil of fairly thin wire k, so as to permit thorough charging. When the discharge occurs, this wire acts as an alternative path, but on account of its self-inductance does not prevent the sparks at the supply gaps.

By both the methods described with reference to Figs. 3 and 4, the two capacity areas h h^1, which, together with the inductance coil between them constitute the radiator by aerial disruption or impulsive rush, are charged. The advantage obtained is that charges so communicated are left to oscillate free from any disturbance due to maintained connection with the source of electricity, and therefore oscillate longer and more simply than when supplied by wires in the usual way. Moreover, the capacity areas of the radiator are thus more conveniently employed as the capacity areas of a receiver without need of disconnection.

The arrangement described with reference to Fig. 4, illustrates most completely the method of charging the capacity areas h h^1 with an impulsive rush.

The action is as follows: The Ruhmkorff coil a charges the jars j, whose outer coats are connected, and discharges them at the starting gap h^{10}. This spark precipitates a discharge at the supply gaps h^7 h^8, and suddenly supplies the capacity areas h h^1 with electric charges, which then surge through the connecting coil h^4 (divided into two parts in this figure), and spark into each other at the discharge gap between the knobs h^2 h^3. This last discharge is the chief agent in starting oscillations which are the cause of the emitted waves. But it is permissible in the arrangements, Figs. 3 and 4, to close this last gap when desired, and so leave the oscillations to be started by the sparks at the supply gaps alone, their knobs, in that case, being polished and protected from ultra violet light, so as to supply the electric charge in as sudden a manner as possible.

Spheres or square plates, or any other metal surfaces, may be employed as capacity areas, but, for the purpose of combining low resistance with great electro static capacity, Lodge prefers cones or triangles, or other diverging surfaces, with vertices adjoining, and their larger areas spreading out into space. A single insulated surface may be used in conjunction with the earth, the earth or conductors embedded therein constituting the other oppositely charged surface. Radiation from an oscillator consisting of a pair of capacity areas is greater in the equatorial than in the axial direction, and, accordingly, when sending in all directions is desired, it is well to arrange the axis of the emitter vertical. Moreover, radiation polarized in a horizontal plane; that is, with its electric oscillations vertical, is less likely to be absorbed during its passage over partially conducting earth or water. A pair of insulated capacity areas, arranged for long-distance signaling, is shown on the left-hand side of Fig. 5.

Fig. 6 shows a single insulated capacity area h, with the earth acting as the other surface, and leading up to the spark knobs h^2 h^3 by a triangular sheet or cone h^1, so as to afford good conductance even to rapidly alternating currents. The wire h^8 in this case leads to one terminal of the Ruhmkorff coil a, the other terminal of which is taken to earth. The capacity area h is insulated as shown at h^{12}.

Fig. 7 shows an arrangement which will catch the wind less, and which is fitted with a syntonized coil h^4.

Fig. 8 shows an insulated metal surface in the form of a roof h of a shed or building, which may be used as a capacity area, suitable connection and apparatus (not shown) for emitting or receiving being placed inside the little house l.

The self-inductance coil, represented at h^4 in all the figures, is a coil of highly conducting wire or ribbon, well insulated by air or by some other medium, as already described, or else covered to a sufficient thickness with insulating material. It may be either a flat coil, enclosing a plane area and shaped so as to have a maximum self-inductance for a given resistance, or it may be a cylindrical coil wound on a finely subdivided iron core, as shown at m, Fig. 9, either ring-shaped, or U-shaped, or straight.

The discharge knobs h^2 h^3 may be arranged at one end of such a coil, as shown in Figs. 2, 3, 7 and 9, or the coil may be in two halves, with knobs inserted in the middle at pleasure.

Several such coils h^4 h^{4x} h^{4xx}, with their knobs h^2 h^{2x} h^{2xx}, may, as shown in Fig. 10, be arranged for use with a single pair of capacity areas, and any one of them may be brought into action by a suitable switch. Thus the desired frequency of vibration or syntony with a particular distant station may be attained by replacing one coil by another, for the frequency can be adjusted either by varying the capacity of the condenser or jar or other conductor employed, or the charged body, or, on the other hand, by varying the number and position of coils or other portion of the discharge circuit. That discharger is in action whose spark gap is allowed to operate, and a switch A^1 B^1 C^1 can determine which of a set of different coils shall be utilized. Fig. 11 illustrates the form of switch indicated at Fig. 10.

An alternative plan to that described in Fig. 10 is to connect the capacity area through one pair of knobs and a single large coil of a considerable number of turns, as shown in Fig. 9, and to have keys or plugs

*From the *Electrical Review*, London.

or switches S^1 and S^2, whereby some of the turns can be shunted out of action, so that the whole or any smaller portion of the inductance available may be used in accordance with the correspondingly tuned receiver at the particular station to which it is desired to signal. This arrangement may be used in lieu of, or in combination with, interchangeable inductance coils such as are shown in Fig. 10; in the latter case they are useful for correcting slight errors in tuning for any one station.

Another plan, and one well adapted to secure accurate tuning, is to arrange some or the whole of a syntonizing coil so that its parts may be made to approach or recede from one another. The one is named by Lodge an adjustable coil, and the others replaceable or interchangeable coils.

A receiver, or resonator, consists of a similar pair of capacity areas connected by a similarly shaped conductor or self-inductance coil, the whole constituting an absorber arranged so as to have precisely the same natural frequency of electrical vibration as the radiator in use at the corresponding emitting station; but it must not have a spark gap such as h^2 h^3, or if it have a spark gap the same must be carefully closed, or shunted, or bridged across by a good short conductor; for example, like Fig. 11, before the arrangement can be properly used as a receiver.

Referring to Fig. 3, it will be seen that that diagram illustrates a combined emitting and receiving apparatus. When in use as a radiator, the gap between the discharge knobs h^2 h^3 is left open. When utilized as a resonator, the said gap is closed by the shunt h^9 (shown on a larger scale, Fig. 11), and the coherer e, battery f, telegraphic receiving instrument g, are connected through a thin wire x, from each end of the inductance coil h (i. e., from each of the capacity areas).

If the Ruhmkorff coil a had been actually connected to the capacity areas h h^1, as in Fig. 2, then it must be detached and substituted by the coherer circuit when a receiver is required; but if the charge has been supplied through gaps, as in Figs. 3 and 4 (and this is the best plan), then the Ruhmkorff connections can be left unaltered, as it in no way then affects the action of the resonator, provided always that the coil is not put in action while the receiving circuit is connected up.

A coherer consists of any arrangement which drops in resistance on receipt of an electric impulse and rises to its old resistance on being subjected to a mechanical impulse, such as a tremor or tap.

A coherer circuit is any known arrangement for observing or recording effects due to fluctuations in the electrical resistance of a coherer.

Lodge makes use of Branly's coherer, in which a pair of conductors are embedded in metallic grains or powder or filings. He prefers to use selected iron filings of uniform size, sealed up in a good vacuum, and with communicating surfaces or electrodes reduced to points of thin platinum wires fused into the glass with their ends close together. Instead of the Branly or other well known coherer, Dr. Lodge also makes use of the coherer illustrated, Fig. 12, wherein a point n rests lightly on a flat metallic surface o. For instance, a needle point of steel or platinum may make light contact with steel or aluminum, or other spring like a watch spring, straight or bent, fixed at one end p and delicately adjustable by a thumb-screw q at some other part, so as to regulate the pressure which it exerts on the fixed needle point.

Whenever an electric wave or impulse from a distant radiator arrives and stimulates electric vibrations in the syntonized resonator or absorber arranged for the purpose, the delicately adjusted junction of the two metals, or of the metallic or other particles which are connected up to the resonator so as to feel these vibrations, suddenly and greatly changes its electrical resistance, and this diminution of resistance enables a local battery to actuate a relay, or a telephone, or other telegraphic instrument in circuit therewith.

To break contact again, or to restore the original greater resistance, any form of mechanical vibration suffices. Lodge mounts on the stand of the coherer either a clock or a tuning fork or a cogwheel, or other device for causing a shake or tremor of sufficient intensity, maintaining it in motion by either a spring or weight, or by electrical means. In Fig. 12 r and s are two wheels of a clockwork train. Upon the arbor (or on a disk mounted thereon) is a series of serrations or the like t (shown exaggerated in the drawing), which, as the wheel rotates, effects the vibration of the lever or spring o. Such a tapper as is used in dentistry likewise serves very well, or the mere motion of any clockwork attached to the stand will suffice. An exceedingly slight, almost imperceptible tremor is all that is usually needed.

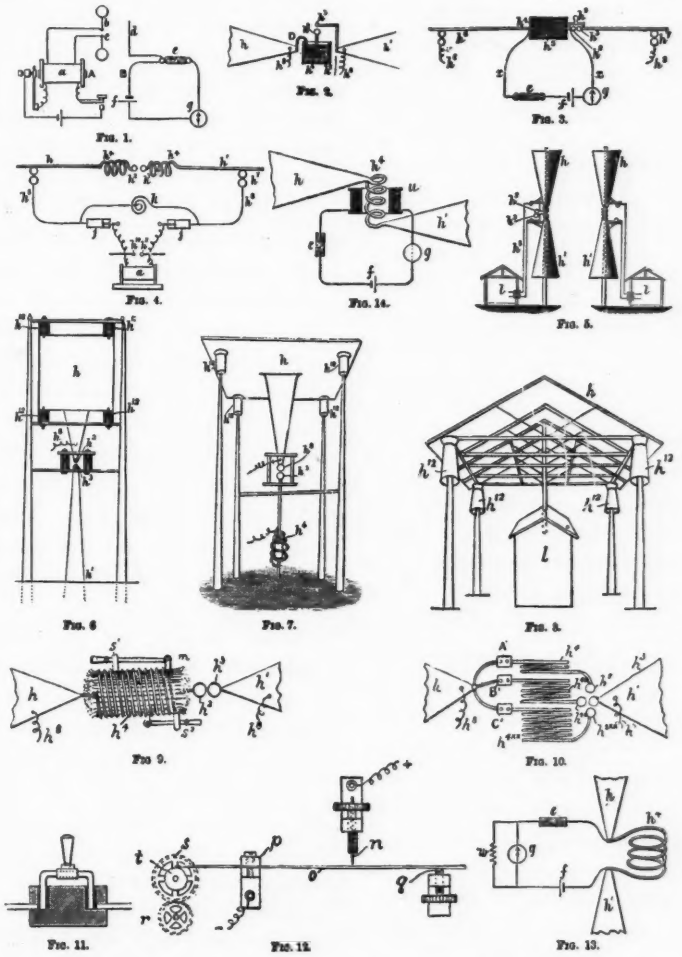
The diminution of resistance takes place instantaneously, and contact is broken again in a very small fraction of a second later. The instant it is broken the junction is ready to receive a fresh signal. The rapidity of signaling depends on the quickness of response of the signaling instrument, and it depends also on the rapidity with which the mechanical arrangement can break or interrupt the cohesion directly after the electrical stimulus has established it. Lodge has found that when a telephone is used the coherer restores itself without specially arranged tremor, and that a telephone is the quickest responder that can be used.

In the coherer circuit the coherer is usually arranged with the coherer in simple series with a battery (voltaic or thermal) and a galvanometer or other indicator or recorder of fluctuations of current The terminals of this series of instruments are then connected to the capacity areas of the receiver close to its self-inductance coil, so that this same coil of wire completes and forms an essential part of the coherer circuit. The coherer is thus affected by every electrical disturbance occurring in the connecting coil or in its capacity areas, and by the aid of the battery at once enables the telegraphic or telephonic instrument to appreciate and indicate the signals. This plan is shown in Fig. 13. It is an improvement on any mode of connection that has previously been possible without the connecting coil.

In some cases Lodge, as shown in Fig. 14, surrounds the syntonizing coil of the resonator with another or secondary coil u (constituting a species of transformer), and makes this latter coil part of the coherer circuit, so that it shall be secondarily affected by the alternating currents excited in the conductor of the resonator. The coherer is thus stimulated by the currents in the secondary coil, and not primarily by the currents in the syntonizing coil itself, the object being to leave the resonator freer to vibrate electrically without disturbance from attached wires.

In all cases it is permissible, and sometimes desirable, to shunt the coils of the telegraphic instrument by means of a fine wire or other non-inductive resistance, as shown at w in Fig. 13, in order to connect the coherer more effectively and closely to the capacity areas or receiving arrangement whereby it is stimulated.

Dr. Lodge has not yet published the results of any experiments in which distances have been traversed by means of his signaling apparatus as great as those that have been attained by the Marconi system. A few months ago he informed us that he had transmitted signals over a distance of one mile, without any perceptible falling off in the efficiency of the apparatus. This points to much better results being achieved. The utilization of resonance would appear to indicate that the inconvenience of the long vertical conductor in the Marconi apparatus may be altogether got rid of. The results of further experiments with Lodge's apparatus will be eagerly looked for by those interested in this subject.



DIAGRAMS ILLUSTRATING "LODGE'S SYSTEM OF SYNTONIZED WIRELESS TELEGRAPHY."

We have received from the author "High-Powered Dredges and Their Relations to Sea and Inland Navigation," being a report by Lindon W. Bates, read before the Seventh International Congress on Navigation recently held at Brussels.

Electrical Review

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

CONTENTS.

Views, News and Interviews..... 145
Boston's Street Railway Convention..... 145
Portable Electric Pumps..... 147
Lodge's System of Syntonized Wireless Telegraphy..... 148
The New Work on the Metropolitan Street Railway Lines in New York City..... 150
American Association for the Advancement of Science..... 151
Wall Street and the Electrical Stock Market.... 151
The Duty on Electric Light Carbons..... 151
American Electrical Works' Clambake..... 151
New York Street Railway Association..... 151
Association of Edison Illuminating Companies. 151
Personal..... 151
Electric Railway Notes..... 152
An Engine Lathe With Gear-Cutting Attachment..... 152
Against Western Union..... 152
Lots of Wire Used for Telephones..... 152
The Oris Incandescent Lamp-Holder..... 153
The United States Is at the Top of the Heap.... 153
Neither Do We..... 153
The Storage Battery in Street Railway Power Stations..... 154
Instruction by Correspondence..... 154
Electric Light Flashes..... 155
Death of Dr. John Hopkinson Reported..... 155
McKenney & Waterbury..... 155
The Telephone in Cape Colony..... 155
A Golden Fleece..... 156
England Hears of Our Electric Gun..... 156
X-Ray Equipment for a Hospital Ship..... 156
Electric Railways in Shanghai, China..... 156
Literary..... 156
Photographing Currents from the Human Body..... 156
Theory of Hearing Suggested by the Telephone 157
Development of the New York Telephone System..... 157
Advance Information..... 158
Three-Phase Apparatus in Manchester, England 158
Electrical Patents..... 159
Kindred Interests..... 160

Advertisers' Alphabetical and Classified Index on page xii.

The electrical industries of Niagara Falls and vicinity boomed splendidly during August. An unusually large number of contracts for electric power were signed, and several new industrial undertakings were established. The future of the territory in question is great.

THE NEW WORK ON THE METROPOLITAN STREET RAILWAY LINES IN NEW YORK CITY.

New York is a little slow in some things, and, it may be said, especially slow in all that concerns any project affecting the public comfort and convenience. But some of the corporations which administer to the public comfort are fortunately not "tarred with the same stick." A brilliant example of this fact is the Metropolitan Street Railway Company. Some of the sensational newspapers have reviled this organization as a grasping monopoly, a trampler on the rights of the public; indignation meetings have been held to throttle its open and straightforward efforts to secure the right to install modern motive power for the cars on important thoroughfares; fossiliferous plutocrats have been hypnotized into absurd heroics over the alleged corruption of municipal honor; tons of paper have been destroyed in so-called protests against the octopus whose coffers were bursting with their burden of nickels. But the Metropolitan company knew what it was about and went ahead.

Finally, all obstructions were fought down, and work was begun towards the banishment of the perennially weary car horse.

After the first underground trolley line was successfully installed on Lenox avenue, the system was applied to Fourth and Madison avenues, and other east side lines and the success was really electric. To-day there is not a patron of any of these lines nor an abutting property owner who would wish to go back to the horse-car days. Such success decided the management to adopt the system for all their other lines, and at present the Sixth and the Eighth avenue lines are under construction with a vigor probably never before shown in any city in the world. After all legal and other obstacles were removed, preparations on a huge scale were made for very rapid work. It was decided to close the lines to car traffic and proceed with the construction with the utmost speed.

The energetic president, H. H. Vreeland, and his able engineer, M. G. Starratt, finally decided upon the methods now in force. The contract system was done away with, construction gangs were organized and a carefully arranged programme laid down for the gigantic job. Material was distributed where no time would be lost in handling, an army of thousands of skilled and unskilled laborers was drafted and the attack began all along the line. Every man had his work laid out under the skillful plan arranged by Engineer Starratt, and no sooner had the paving stones and dirt begun to fly at a given section, than, as if by magic, a few hours began to develop a full-fledged track in its place. The method is admirable. The trench is dug, yokes dropped in place, rails bolted on, slot-rails secured, tie rods inserted and conduit plates attached, and then the whole structure is lined up and surfaced on blocks and wedges. Then the whole trench is filled to sub grade with first-class concrete, and once this sets all is ready for finishing up and repaving. Glazed clay conduits for the feeders are bedded in the concrete, and manholes constructed at suitable intervals.

Notwithstanding the great speed with which the work has progressed, much better time would have been made but for the numerous problems encountered in the shape of existing systems of sewers, gas and water pipes, electric light, telephone and telegraph subways, and all other subterranean structures which make our streets worse than the soil of a forest of centenarian oaks. These problems were creatures of chance, each to be solved by itself. The masterly manner in which they have been met and the orderly methods employed reflect great credit on the company's president and engineer. Within a few days, it is said, both the Sixth and Eighth avenue systems will be in full operation, thus opening two very popular north and south routes, and to some extent the overburdened Broadway line may find relief.

Mr. Russell Howland, New York representative of the ELECTRICAL REVIEW, has returned to his duties on this paper. He served throughout the war as a member of the New York Naval Militia on board the auxiliary cruiser "Yankee," and took part in all the engagements at which his ship was present. The Naval Reserve, as the organization is popularly known, has earned the respect and commendation of the regular service for its excellent work during the war. Men of wealth and refinement gave up their private affairs and have performed cheerfully and without question all the work of a "jackie," and have served their country in an arduous branch of the national military establishment with an enthusiastic patriotism which has been the wonder of the older nations. They are not heroes, and do not desire to be known as such—they are Americans! Their patriotic duties ended, they take up their peaceful vocations where they left them. As a member of the New York Naval Militia who has served his country faithfully, we welcome home Mr. Howland.

The Hawaiian Islands are now a part of these glorious United States, and consequently the subscription rates of our 22,000 periodicals will hereafter be the regular domestic prices. Mr. John Cassidy, superintendent of the Mutual Telephone Company, at Honolulu, in paying his $5 subscription to the ELECTRICAL REVIEW for the current year, sends an extra $3 for 1899 and says:

"If I have made a mistake in the advance rate for next year, let me know by return mail and it will be made all right. I feel so good over this change that I can stand a pretty heavy assessment. Aloha."

We congratulate Mr. Cassidy and his fellow workers in the telephone field on their good fortune in becoming citizens of the greatest republic the world has ever known, and we bid them welcome.

How did we ever get along without electric fans? The past week of torridity, although coming late in the season, created a demand for electric fans, which kept the manufacturers and supply dealers hustling to satisfy.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

CLOSING SESSIONS OF THE FIFTIETH MEETING, AT BOSTON.

After a long and stormy session, on Thursday, August 25, the council of the association elected Prof. Edward Orton president for the coming year, and decided upon Columbus, Ohio, as the place for the next annual convention of the association. Prof. Edward Orton is state geologist of Ohio. He was graduated from Harvard University, and has held many important positions in scientific work. He has had charge of the Ohio state survey since 1881.

Friday was known as "Cambridge Day." The members of the association were, by special invitation of the president and fellows, guests of Harvard University for that day, and, while but little work was done in the way of meetings or reading of papers, the association thoroughly enjoyed itself in partaking of the hospitality of the university. All departments were open throughout the day for inspection by the members of the association, and in many departments special exhibitions were given for the benefit of the scientist.

The sections in chemistry, physics and anthropology met for short sessions in rooms set apart for their use. Lunch and supper were served to members in Memorial Hall. In the evening President Eliot, of the university, delivered an address.

After five days of work and pleasure, the association closed its convention on Saturday. The visitors are greatly gratified with the reception Boston has afforded them. A word of commendation is due to the local committee, who have worked for months to perfect the programme. A special post office was established in the Rogers Building, with a telegraph office, a telephone room, reading and writing halls, information bureaus and railroad offices. As a result, on the arrival of the association members, everything went like clockwork.

The only sections having papers to read were B, C and I, devoted respectively to physics, chemistry and economic science. The last general meeting was held at 10.30 A. M. Many famous scientists were upon the platform. Reports were read, the most important being that of the permanent secretary. This showed that 903 delegates had registered during the convention; 158 being from New York. Canada, England, France, Germany, Brazil, Japan and Australia were each represented. Four hundred and forty-three papers had been read, and almost six thousand dollars surplus was in the treasury of the association. Resolutions of thanks were extended to all who had helped to make the jubilee meeting of the association a memorable one.

Wall Street and the Electrical Stock Market.

Business on the Stock Exchange during the past week was dull and prices receded slightly. This was taken to indicate that operators have got over their buying impulse and are willing to sell at a profit. All the forces generally tend toward a buoyant market. On the New York Exchange General Electric closed the week at 46⅜, the highest price recorded for some time. Western Union closed at 94⅛.

The Duty on Electric Light Carbons.

Collector Bidwell, of New York, has received instructions from the Treasury Department to appeal from the decision of the Board of General Appraisers in assessing carbon sticks for electric lighting at only 35 per cent *ad valorem*. The department holds that they are subject to duty at the rate of 90 cents per 100, which was the rate at which duty was originally assessed by the local appraiser.

American Electrical Works' Clambake.

The annual clambake given by the American Electrical Works, Providence, R. I., to the electrical fraternity, will be held this year on Saturday, September 10, the day after the close of the Boston meeting of the American Street Railway Association. An unusually large number of guests is expected to partake of General Manager Phillips's hospitality.

New York Street Railway Association.

The Street Railway Association of the State of New York will hold its next meeting at Manhattan Beach, September 14 and 15, and not at the Hotel St. George, Brooklyn, as has been incorrectly reported.

The American Bell Telephone Company's instrument statement for the month ended August 20 shows:

	1898.	1897.	1896.
Gro s output	24,803	15,767	9,675
Returned	12 022	10,154	7.850
Net output	12,841	5,613	1,825
Since December 20:			
Gross output	212.747	143.545	136.358
Returned	95,328	62.001	61.517
Net output	117,419	81,544	74.836
Total	1,036,540	855,393	751,372

ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

THE FORTHCOMING CONVENTION AT SAULT STE. MARIE.

As already announced in the ELECTRICAL REVIEW, the 1898 convention of the Association of Edison Illuminating Companies will be held at Hotel Iroquois, Sault Ste. Marie, Mich., commencing Monday, September 12, and continuing till noon of the following Wednesday. It is expected that this will be the best convention ever held by the association. It is planned that as many as can should go in a body on the steamship "Northwest," of the Northern Steamship Company. All eastern delegates are to meet at Buffalo on the "Northwest," which sails Friday, September 9, at 9.15 P. M., central standard time (10.15 P. M., eastern standard time). Delegates from Ohio and the South can meet the steamer at Cleveland, Saturday morning, September 10, where it is due to arrive at 7.45 A. M., leaving 9.15 A. M. Delegates from Chicago and western cities should board the boat at Detroit, Saturday afternoon, between 4.15 and 4.45 o'clock. The secretary will be at the ticket office of the steamship company, on the dock at each landing, with tickets for passage and rooms on boat. Reduced round-trip fares have been secured.

Papers will be read upon the following subjects: "Methods of Charging," "Developments in Transmission Apparatus," "Meters," "What We Saw Abroad," "Municipal Ownership," "Problems of Smaller Stations," report of lamp-testing bureau, including report of tests of non-Edison lamps. These subjects will be handled in the usual able manner by those best fitted to do so, and will present much new information of great value.

"What We Saw Abroad" will be a partial report of the observations of the trio of engineers from the Edison Electric Illuminating Company of New York, Messrs. J. W. Lieb, Jr., J. Van Vleck and Arthur Williams, who are now in Europe studying recent developments in electric science and practice. This report will necessarily be short, for there will be but little time after their return for an elaborate paper, so the discussion following it will be almost as valuable as the paper itself.

The report of the lamp-testing bureau will be of great interest and value to purchasers and users of lamps, for it makes direct comparison of the value of all prominent lamps in the market. This report will also make clear the value of the lamp-testing bureau to illuminating companies. The Edison Sault Electric Company, on whose invitation the convention is held at "The Soo," has prepared a series of entertainments for the ladies during sessions of the convention, and for ladies and delegates during recess Monday and Tuesday afternoons.

PERSONAL.

Mr. James A. Scrymser, of New York city, president of the Pacific Cable Company, will sail on September 12 for Japan to make contracts with the Japanese Government. The proposed cable will cost $10,000,000.

Superintendent Frank C. Mason, of the Brooklyn, N. Y., police telegraph bureau, has been appointed one of the Committee of One Hundred which will welcome Troop C on its return to Brooklyn from the war.

Mr. Cyrus O. Baker, Jr., will sail on Saturday for London, Paris and St. Petersburg in the interest of his large platinum importing house, Baker & Company, of this city and Newark, N. J. Mr. Baker will be absent several weeks investigating the platinum product of Russia, of which he is a recognized expert.

Mr. James P. McQuaide, of the National Conduit and Cable Company of New York, is receiving the congratulations of his friends over the advent of a young electrician in his home. Mr. McQuaide is very properly proud of the junior scion of his house, and shows appreciation of congratulations the moment they are extended.

Lieut. T. C. Wood, of the Ball & Wood Company, had a varied and interesting experience during the late war, having been fortunate in serving aboard the "Gloucester," of which he was senior watch officer. The "Gloucester" for a time was one of the Havana blockading squadron, and subsequently served on the Santiago blockade, and on July 3 carried off the honors by annihilating the "Furor" and "Pluton." Lieutenant Wood as naval aide was present at the surrender of the Spanish army at Santiago, and subsequently was in command of the landing parties at Porto Rico which captured the first footholds on that island. Among the souvenirs brought home by Lieutenant Wood is a watch presented to him by the captain of the "Furor," in recognition of the admirable treatment of the officers and crews of the Spanish ships after the battle of Santiago.

ELECTRIC RAILWAY NOTES.

The Philadelphia Traction Company has declared a dividend of $2 per share, payable October 1. Books close September 20; reopen October 1.

The Chicago City Railway Company has declared a quarterly dividend of three per cent, payable September 30. Books close September 15 to 20.

A company has been formed to operate an electric railway from Watertown to Sackett's Harbor, N. Y. The amount of capital stock is $100,000.

The gross earnings of the Union Traction Company, of Philadelphia, for 28 days of August increased $50,000 over those for the same period last year.

The Sedalia, Mo., Electric Railway and Sedalia & Brown Springs Electric Railway have been sold to Stewart & Company, of New York, for $400,000.

The Augusta, Ga., Railway and Electric Company, by reason of its increased patronage, has found it advisable to put in new dynamos and other improvements at an outlay of $25,000.

At the meeting of the board of directors of the Cortland & Homer New York Traction Company, the following officers were elected: President, P. S. Page, of Scranton; vice-president, Herman Bergholtz, of Ithaca; secretary and treasurer, G. Harry Garrison, of Cortland.

James G. Graham has been appointed temporary receiver of the New Paltz & Wallkill Valley, N. Y., Railroad Company by Justice Cohen, of the Supreme Court. The appointment was made on an application of a majority of the directors of the road for a voluntary dissolution of the corporation. The bond of the receiver was fixed at $50,000.

The report of the Troy City, N. Y., Railway for the quarter ended June 30 last is as follows:

	1897	1898
Gross earnings	$133,447	$132,743
Operating expenses	65,936	65,314
Net from operation	67,511	67,429
Other income	1,039	1,750
Gross income	68,550	69,180
Fixed charges	36,896	35,997
Net income	31,654	33,182
Cash on hand		12,223
Profit and loss (surplus)		60,785

The first mortgage bondholders' committee of the Terre Haute, Ind., Street Railway Company has prepared a bondholders' agreement and has secured the deposit of more than a majority of the bonds thereunder. The limit of time for receiving deposits at the Illinois Trust and Savings Bank, of Chicago, has been fixed at September 15.

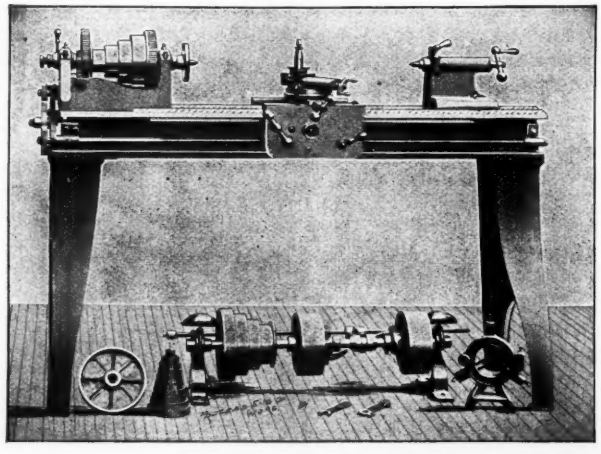
The Buffalo, Tonawanda & Niagara Falls, N. Y., Electric Railroad has been formed by the consolidation of the Buffalo, Tonawanda & Niagara and the Tonawanda Railroad companies. Incorporated capital, $1,500,000. Directors, James A. Roberts, Buffalo; Timothy E. Ellsworth, Lockport; Henry B. Smith, Bay City; James Low, Niagara Falls; Benj. L. Rand, North Tonawanda.

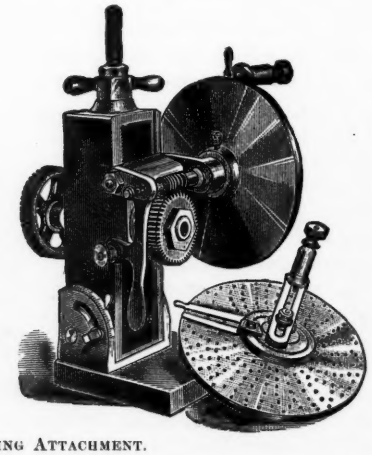
A St. Louis dispatch says that a local street car manufacturing company is negotiating a contract for the completion of the largest order for street cars ever made by an American manufacturing company for use in Japan. The contract will call for 150 of the finest cars, and when they are completed they will be shipped via San Francisco direct to Kioto, Japan. Within the next ten days a party of Japanese capitalists will arrive in St. Louis direct from the Orient to complete the details of the contract, and work will at once be commenced on the new cars.

The Rome, N. Y., City Railway Company report for the year ended June 30 last as follows: Gross earnings, $4,986; operating expenses, $5,834; net loss, $848; other income, $263; gross loss, $585; fixed charges, $130; net loss, $715; deficit to June 30, 1898, $1,698. The general balance sheet shows as follows: Assets—Cost of road and equipment, $50,000; cash on hand, $445; open accounts, $81; materials and supplies, $121; profit and loss (deficiency), $1,699; total, $52,346. Liabilities—Capital stock, $50,000; loans, $1,000; accounts payable, $1,346; total, $52,346. The number of passengers carried during the year was 100,000. The six employés received $3,032 in wages.

An Engine Lathe With Gear-Cutting Attachment.

The accompanying illustrations represent a 12-inch by five-foot engine lathe and gear-cutting attachment, manufactured by W. C. Young Manufacturing Company, of Worcester, Mass. The lathe has a hollow crucible steel spindle running on long, carefully-fitted bearings. The centers are Morse taper No. 2. The cone is of large diameter and the gearing throughout is exceptionally strong. The tail stock has a bearing of eight inches and allows the compound rest to be operated when set parallel to the ways, and is locked to the bed from the back side by a lever. The lead screw is furnished either of the English (Whitworth) or metric standards, is operated by an open and shut nut in the apron and changed from right to left hand by reversing the lever in the head. The feed is operated by a worm gear and worm driven by the slotted feed screw. The carriage has a bearing of 12 inches on the Vs.





FIGS. 1 AND 2.—AN ENGINE LATHE WITH GEAR-CUTTING ATTACHMENT.

This lathe is made with raise and fall or plain gib rest and with foot-power attachment in place of the countershaft, at the same price. Each lathe is furnished with friction countershaft, large and small face plates, wrenches, centers, and a full set of change gears. The lathe swings over the Vs 12½ inches, over the compound rest eight and one-half inches, over raise and fall rest seven inches, over gib rest eight and one-half inches, and the bed is made in three lengths, four, five and six feet long. The distance between centers, with five-foot bed, is 37 inches. The cone has a diameter of seven inches at the large end and two and seven-eighths inches at the small end for one and one-half-inch belt, and the gearing has a ratio of seven to one, cutting threads with English lead from four to 40 and with metric lead from eight millimetres to .75 millimetre. The countershaft has pulleys eight inches by three inches and should make 150 revolutions a minute. This lathe weighs, boxed, ready for sea shipment, with four-foot bed, 720 pounds; five-foot bed, 750 pounds; six-foot bed, 825 pounds.

The gear-cutting attachment herewith illustrated is for accurately cutting spur and bevel gears, and can be attached to this or any other small lathe. It covers a large range of work, dividing all numbers to 50, all even numbers to 100 and multiples of the same above 100.

Against Western Union.

At Carthage, Mo., on August 22, the test case against the Western Union Telegraph Company instituted by Senator Howard Gray to recover three cents' charge against him for revenue stamps, and until payment of same was made his messages were held up, was heard before Justice Harvey Tyree, who made entry against the company, the costs being $5. Acting upon instructions from President Eckert, of New York, Attorney Thomas Hackney took an appeal to the circuit court in September; also to, if needful, carry to the higher courts.

Lots of Wire Used for Telephones.

The Erie Telegraph and Telephone Company is reported to have placed an order for 500,000 pounds of copper wire, making 1,000,000 pounds consumed during 1898, exclusive of copper wire used in cables and inside wiring. As the Erie company represents about one-twelfth of the telephone interests of the country, it is fair to suppose that the entire telephone interests will use 12,000,000 pounds this year.

The Otis Incandescent Lamp-Holder.

A unique little device known as the "Otis" adjustable incandescent lamp-holder is just being put on the market by the Perkins Electric Switch Manufacturing Company, of Hartford, Ct. The accompanying illustration gives an idea of the device. It is attached immediately to the lamp cord, and requires no brackets or arms of any kind, and may be used with reflector shades of any description. By its use the lamp may be raised or lowered, or placed at any angle for reflection. When used in large factories it fills a long-felt want where many operators are employed at individual machines. In putting the holder in position, it is screwed to the socket in the same manner as the shade-holder, the neck pulls apart, and the fiber bushing is removed to go over the wire. The neck then snaps over the fiber in its original position. Because of its cheapness, it is believed by the manufacturers, who, by the way, are the Otis & McKirdy Company, Bristol, Ct., that it will replace the numerous expensive and complicated incandescent lamp-holders now on the market.

THE OTIS INCANDESCENT LAMP-HOLDER.

A test of the artesian well, just completed by the Electric Light Company, at New Albany, Ind., shows a flow of 1,360 gallons per hour two feet above the surface.

The United States Is at the Top of the Heap.

[*From the Boston News Bureau.*]

Viewed in a broad sense nothing more could be asked for the American situation. Before all the world, as well as before ourselves, we are now at the top pinnacle of success.

We hold the respect of the world for our democratic institutions and for our abilities to maintain our voice among the nations when it comes to enforcing speech with arms and armaments.

We are the supreme granary of the world, and are rapidly marching to the front not only as the most inventive nation, but as the greatest manufacturing nation. In nearly every department where we were once importers we are now exporters.

Our greatest industrial triumph today is the wide distribution of our monetary resources. The East, the West, the North and the South all now have money to loan as well as to spend, and a war in Europe would quickly make this country the monetary center of the world.

In the security market it would seem as if a reaction was due, especially in those stocks which have had such a phenomenal advance. In spite of this conservative belief, and in face of large realizing sales, prices refuse to decline to any appreciable extent, and when slight setbacks occur more buying than selling orders appear.

There are no indications as yet that the buying power is exhausted, and until it is the "bear" element is not likely to make any great impression upon prices.

A. O. Granger, W. J. Kennedy, L. N. Poulin, J. Copping and K. McDonald were elected directors at the annual meeting of the Auer, Ont., Light Company. At a meeting of the newly elected directors Mr. Kennedy was elected president, Mr. McDonald vice-president and Mr. Poulin secretary-treasurer.

Show-Window Lighting.

A matter of no little importance to-day with the electrician is the question of show-window lighting. How often the merchant who wishes either to install a well lighted window or to improve his present unsatisfactory method of lighting, goes to the electrician for advice, and asks what, in his opinion, is the most pleasing and efficient method of show-window lighting now in use? It behooves the electrician, therefore, to become acquainted with the advancement along this line, not only for his customers' benefit, but for his own also. It would be well for any person who is in the least interested in this branch of the lighting problem to inquire about and observe the results obtained from the use of Wheeler reflectors.

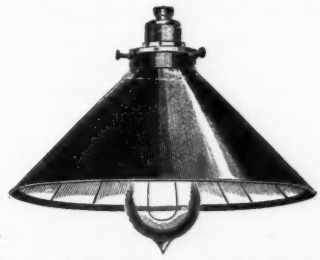
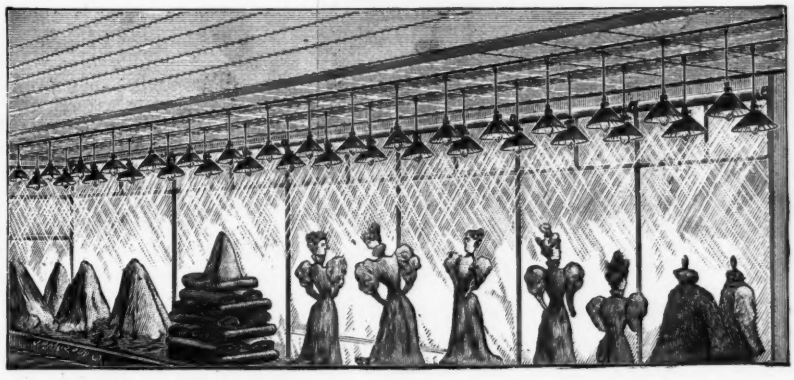
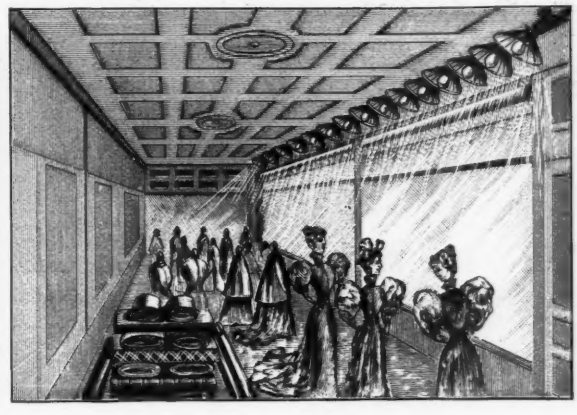


FIG. 1.—WHEELER REFLECTOR FOR INCANDESCENT LAMPS.





FIGS. 2 AND 3.—EXAMPLES OF SHOW-WINDOW LIGHTING WITH WHEELER REFLECTORS.

From an economical and attractive point of view, the results given by the reflectors manufactured by the Wheeler Reflector Company, of Boston, have been most gratifying. Their system is based upon the general principle of special shapes for special uses, and their forms are carefully worked out upon mathematical principles, thus assuring the greatest possible efficiency.

One of their best and most pleasing methods of window illumination is the arrangement of a row of reflectors on ball and socket brackets, close to the ceiling at the very front of the window, as shown in the illustration herewith. A curtain or panel is desirable to hide the lamps from view on the sidewalk. The results from this method are said to be invariably satisfactory.

Another method, and perhaps a more common one, is to drop the reflectors from the ceiling, making the cost of the entire outfit but nominal. The number of reflectors required depends upon the character of the goods displayed and the degree of illumination desired.

The Wheeler Reflector Company also make other forms of show-window reflectors, and are the originators of numerous methods of general and special illumination, having always given particular attention to lighting problems. They will gladly answer inquiries relative thereto, and indicate the results obtainable from the use of any of the various-shaped reflectors and shades they manufacture.

Neither Do We.

At a large electric light station the fireman flooded the boiler, with the result that the automatic governor was wrecked and the eccentric rod bent into a fish-hook, says the *American Machinist*. Upon being reprimanded by the chief engineer, this fireman, who has been around steam plants, etc., for 10 years, remarked: "Well! I don't see how in h—l the water got into that governor," and the engineer, fearing that he might try it again in an endeavor to learn, laid him off indefinitely. Possibly some liquid was the cause of the trouble, and possibly elsewhere than in the governor.

The Southampton, N. Y., Electric Light Company will pay a five per cent dividend in September. This company has heretofore spent all its earnings in increasing and improving its plant, but now has begun to turn the increased earnings over to the stockholders.

THE STORAGE BATTERY IN STREET RAILWAY POWER STATIONS.

THE FIRST STORAGE BATTERY AUXILIARY IN CONNECTION WITH NIAGARA POWER.

The Buffalo, N. Y., Railway Company has recently installed in its Niagara street power-house a large storage battery for the purpose of regulating the fluctuating load due to the 300 or more cars operated from that point, to carry the peak of the load, and to serve as a reserve of power in case of the failure of the supply from Niagara Falls. The station contains steam generating units of a total capacity of 7,000 horse-power, and four rotary transformers, each of about 500 horse-power capacity. These are fed with alternating current at 25 cycles per second from the transmission lines of the Niagara Falls Power Company, and deliver direct current at 550 volts to the railway circuit.

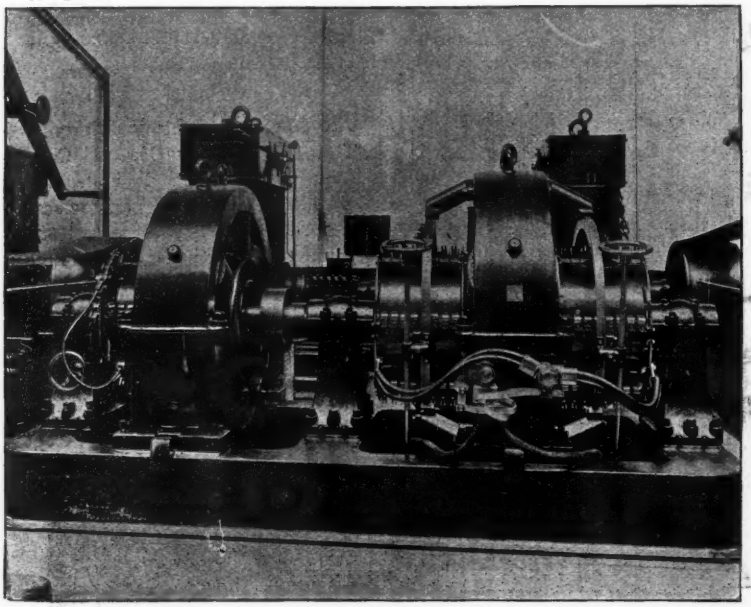


FIG. 1.—MOTOR-DRIVEN BOOSTER IN THE BUFFALO RAILWAY COMPANY'S NIAGARA STREET STATION.

The storage battery consists of 270 cells of "chloride accumulator," type 41-G., manufactured and installed by the Electric Storage Battery Company, of Philadelphia, having a present capacity of about 1,200 horse-power when discharged in one hour. The cells are not completely filled with plates, but room has been left for the enlargement of the battery by the addition of extra plates, the ultimate capacity of the tanks being for plates sufficient to give 2,000 horse-power at one hour's discharge. The tanks for the battery are made of ash, dovetailed together and lined with sheet lead. Heavy porcelain insulators mounted on wooden skids support the tanks, the whole resting on the concrete floor of the battery house. This is a one-story brick building, having a concrete floor and plastered ceiling, the roof being supported on iron columns. The floor slopes gently to one side for drainage, and ventilation is accomplished by means of roof openings and windows. Wooden car mats are laid in the aisles between the rows of cells as an insulation. All the cells are in one tier, and on one level, and the arrangement of the conductors is the simplest possible. All the conductors are of copper, covered with lead by a process which results in a thin and firm coating. No trouble has been experienced so far from the gases and spray due to heavy charge rates, and the men working about the battery seem to suffer no inconvenience from them.

The battery is connected at its positive terminal to the main positive bus of the station, and at its negative terminal through a motor-driven booster, Fig. 1, having a capacity of 2,500 amperes at 70 volts to the ground. The functions of this booster are various, and its construction worthy of special attention. The motor end is an ordinary six-pole type of motor, working at 500 revolutions per minute from the main bus-bars. This is direct coupled to the compound-wound booster, which has two commutators of very large size, each carrying six sets of eight brushes. By this arrangement currents as large as 3,000 amperes have been sent through the booster without undue sparking. The machine is provided with a center bearing and the usual self oiling arrangements, and is of very solid mechanical construction.

As the booster is used sometimes to assist the charging of the cells, and sometimes to help their discharge, it is necessary to vary its terminal voltage from zero to a maximum in either direction. This is done by varying the electro-motive force at the terminals of the shunt winding by means of an ingenious switch, shown on the lower left-hand panel of the switchboard in Fig. 2. In the central position of the switch the electro-motive force, at its two points of contact with the resistance, is the same, and no current flows in the shunt. At either of its terminal positions the shunt is actuated by the full 550 volts, the direction of its magnetization depending on the position of the switch. The booster can thus be set to either charge or discharge the battery, or in the position of neutral action, by turning the switch lever on the battery switchboard.

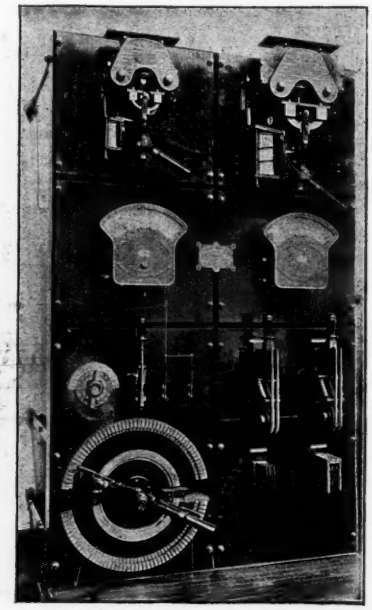


FIG. 2.—SECTION OF SWITCHBOARD IN THE BUFFALO RAILWAY COMPANY'S NIAGARA STREET STATION.

During a 24 hours' run the battery is fully charged by the rotary transformers at night and is switched in for service about 5.30 A. M. The peak at 8 A. M. is taken by the battery, which then runs practically as a regulator until the evening peak comes on. At about 7.30 P. M. the steam engines are shut down and the rotary transformers carry the load until the engines are started again, at about 6.30 the next morning. Before the installation of the battery it was not possible to shut down the engines except from 11 P. M. until 5 A. M., when the load falls off to about 600 horse-power. With the battery it is possible to shut down the engines and run on the rotaries alone for 12 hours in each 24, and for 18 hours on Sundays, while the engines are operated on a constant load while running—the condition of highest economy. During the night all four rotaries in the station are kept fully loaded charging the battery, except from 2 to 5 A. M., when two of them are shut down and the battery cut off to give an opportunity to clean the booster and the rotaries. At these hours the two rotaries that are left running carry the whole load.

When the battery is completed by the installation of the remaining plates it will effect a still further reduction of the steam-power consumption and add materially to the economy of the station.

This installation possesses a peculiar interest in being the first and largest user of Niagara power. The current is received as three phase alternating current at 11,000 volts and 25 cycles per second and transformed to two-phase at the proper pressure for rectification by the rotary converters In connection with the storage battery this system of supply is almost ideal for its flexibility and closeness of regulation. The voltage at the station does not vary more than two to three per cent under the extreme and sudden variations of load due to the exigencies of railway service, and shows a steadiness that would be regarded as excellent in a lighting station.

Instruction by Correspondence.

Comparatively few people as yet realize that a new era in education has begun. Nevertheless, we are already witnessing the dawn of a brighter day for those to whom an education has hitherto been denied. Correspondence instruction removes all the obstacles in the way of working people.

Prominent among institutions teaching by correspondence are the International Correspondence Schools, of Scranton, Pa., well organized and well equipped with a large staff of instructors. The schools have met with extraordinary success since their establishment in 1891 in teaching machine design, steam engineering, electricity, architecture, mechanical and architectural drawing, mining, plumbing, heating and ventilation, chemistry, bridge, railroad, municipal and hydraulic engineering, sheet-metal pattern drafting, English branches, bookkeeping and stenography.

ELECTRIC LIGHT FLASHES.

The electric plant at Quincy, Ohio, has been sold for $1,025 to S. L. Horn, of Huntsville.

The Piqua, Ohio, Electric Company is arranging for the construction of an addition to its plant, so as to accommodate another large boiler. The height of the smokestacks will also be increased.

MR. W. A. MCKENNEY.

The Edison Electric Illuminating Company of Baltimore City has been granted permission by the county commissioners to erect and maintain an electric light line along the Old Annapolis road from Maryland avenue, near the B. & O. bridge, crossing to Brooklyn.

The Dunmore, Pa., Electric Light Company has been incorporated, with a capital of $50,000. Board of directors, James E. Watkins, of Taylor; deputy recorder Anthony T. Irwin, Dunmore; ex-county surveyer Abraham Dunning, ex-mayor John H. Fellows and state senator James C. Vaughan, of Scranton.

The prison at Auburn, N. Y., is to have a new electric light plant, and Barnes and Payton, electric supply dealers of Albany, have been awarded the contract. The work on the plant will be commenced in a few days. Both the women's and men's prison will be lighted by the new system. Nearly 62,000 feet of wire will be required for the lights and connections.

At the annual meeting of the stockholders of the Baldwinsville, N. Y., Heat and Light Company, the following directors were elected: W. F. Morris, J. W. Upson, J. T. Wilkins, W. H. Wells and W. H. Hoffman, of Baldwinsville; Bartlett Smith, of Syracuse, and J. W. Stearns, of Akron. The following officers were also elected: President, W. F. Morris; vice-president, W. H. Hoffman; secretary and treasurer, J. T. Wilkins.

Colonel Bingham, in charge of public buildings and grounds at Washington, D. C., has awarded to the United States Electric Lighting Company the contract for lighting with electricity the grounds south of the Executive Mansion at the rate of 19 cents per light per night, and the grounds immediately surrounding the Executive Mansion on the south and the Washington Monument grounds at the rate of 24 cents per light per night. The difference in the cost of lighting these parks is due to the fact that in one case the government owns the lamp posts, etc., and in the other the ownership rests in the electric lighting company. The contract for lighting Judiciary, Franklin, Lafayette and Lincoln parks has been awarded to the Potomac Electric Lighting Company at the rate of 24 cents per light per night.

Death of Dr. John Hopkinson Reported.

A press dispatch from Berne, Switzerland, via London, August 29, says that Dr. John Hopkinson, the celebrated English electrical engineer, his son and two daughters were killed on August 27 by falling over a precipice while ascending the mountains in the canton of Valais. Dr. Hopkinson and his family were exploring the mountains without a guide.

McKenney & Waterbury.

Visitors to the convention of the American Street Railway Association, in Boston, this week will doubtless be interested and instructed by making a visit to the establishment of McKenney & Waterbury, at the corner of Franklin and Congress streets. This firm, which recently celebrated its tenth anniversary, is the largest manufacturer of gas, electric and oil fixtures in New England. The firm's quarters are in one of the finest buildings in Boston. They occupy the whole of the building, which is seven stories high, with a floor space of 25,900 feet. They now employ 75 people, among whom are some of the best draughtsmen and mechanics in their line in the country.

ESTABLISHMENT OF MCKENNEY & WATERBURY, BOSTON, MASS.

Owing to the ever-increasing demand for the highest art in the fixtures and interior decorations of our modern houses, it has become absolutely necessary to consider art in gas and electric light fixtures quite as important as workmanship and quality of material. Messrs. McKenney & Waterbury have in their warerooms hundreds of designs in lamps, gas and electric light fixtures, and it is an artistic treat to look them over. They make the heavy and elaborate fixtures, and those of fine, artistic lines, in brass, bronze, iron, crockery and china, to suit all tastes and artistic temperaments.

Mr. W. A. McKenney was born in Boston and entered the gas and electric light business upon leaving school, in the employ of his father, Mr. C. H. McKenney, who died some 10 years ago, one of the oldest men in the business and a man highly respected for his honest business dealings. Mr. McKenney is a man of rare executive ability, and is one of the most popular business men in the New England States. He looks particularly after the large contracts and purchasing of goods.

Mr. F. S. Waterbury was born in Darien, Ct. For several years he was employed by Oxley, Giddings & Enos, of New York city. It was with this concern that Mr. Waterbury laid the foundation of his great knowledge of the business. Mr. Waterbury is one of the highest authorities on gas and electric light fixtures in the country. He has complete mastery over every detail of the business.

The Telephone in Cape Colony.

The telephone service of Cape Colony, South Africa, is under the control of the colonial government. On April 9, 1898, there were 1,535 instruments in use, and the revenue for 1897 amounted to $56,137.22. There are 869 miles of wire and 780 subscribers. Seven exchanges in the colony work on the single-wire system, but arrangements are being made to have all lines duplicated, and in future no exchange will be established except on the metallic circuit system. In the course of the next few months the underground cable system in Cape Town will be completed and exchanges established in the suburbs.

MR. F. S. WATERBURY.

Col. S. G. Booker, of the Phœnix Carbon Manufacturing Company, St. Louis, arrived in New York city last week.

A Golden Fleece.

[*From the London Electrical Review.*]

The story goes that some courtiers, who used every artifice to keep within the royal favor, wished to make His Majesty believe himself to be an expert angler. But there was no bite, and the king got angry. Thereupon the courtiers secured possession of the first fish they could lay hands upon, and gave secret instructions to a diver to fasten it to the end of the line. The game would perhaps have answered had not a smoked fish been fastened there in error. Royalty knew the difference, with the result that some one suffered. Without pointing a moral to adorn this tall tale, we may remark that a recent event recorded in America is just about as good. A certain Baptist minister, blessed with the name of Rev. P. F. Jernegan, like all good Baptists, had a great belief in water. He found no difficulty in obtaining both gold and silver from the bottom of the sea, and the Electrolytic Marine Salts Company came into existence for the purpose of working out his secret process. Gold and silver were obtained, it is true, but we have seen it stated somewhere that there were confederates, and a diver was in the parson's employ. Some one discovered a neatly laid deception scheme, after the style of the smoked-herring story, and now it is stated that the Electrolytic Marine Salts Company has stopped the issue of stock, pending further investigation, as the inventor of the process, being, as we remarked, a good Baptist, has again testified to the efficacy of water treatment by himself setting sail for Europe by the first ship without giving notice to his associates. It seems that the company has collected about $1,000,000 from the public, and paid to Mr. Jernegan $338,378. Those connected with the Boston office are stated to be men of honorable reputations, who will spare no effort to ascertain if there has been any deception. Our New York namesake suggests the following refrain for a chorus to be sung by the stockholders of the now celebrated Electrolytic Marine Salts Company: "Done again! Jernegan gone again! Will he pay back again? Ne'er again!" The whole of which story we take *cum grano salis!*

The ELECTRICAL REVIEW has received from general manager E. C. Bickel, of the Elkhart, Ind., Telephone Company, a pamphlet entitled "The Development of the Telephone," giving an account of the establishment of the independent exchange at Elkhart and a list of subscribers.

England Hears of Our Electric Gun.

[*From the Electrical Engineer, London.*]

The long solenoid electric gun is, we are told by a bashful "prominent savant," feasible and capable of scientific proof. Such a proof is supposed to be given by him in the ELECTRICAL REVIEW, of New York, but his name is not attached, and the editor unkindly remarks that he has an india-rubber imagination. The writer aims at a muzzle velocity of 6,000 feet per second, and expects to get this from a solenoid gun 100 feet long. The time he calculates between the shot starting to move and its leaving the gun is one-fifteenth of a second, and a current of 95,000 amperes at 3,000 volts is to be started in different segments of the solenoid in that short time. The effects of self-induction are evidently wiped out by the india-rubber imagination, and the author also does not trouble to discuss the theoretical value of such a solenoid as a means of mechanical propulsion. It is so much more simple to assume that the energy of the shell on leaving the gun is the same as that expended in the solenoids. After this the beauty of the gun is apparent, and also the idea that such a gun could work with an open breech so that a continuous stream of shells could be delivered. We are afraid, however, that there is too much india-rubber in the figures, and that ordnance experts will not trouble to check them.

X-Ray Equipment for a Hospital Ship.

The Swett & Lewis Company, of Boston, dealers in X-ray apparatus, recently secured the contract for furnishing the X-ray outfit for the hospital ship "Bay State." A 10-inch coil of special design was furnished, to be run from storage batteries, the batteries being charged from the dynamo of the ship. Six of the "Type W" tubes, manufactured by the Swett & Lewis Company, as well as a large fluoroscope, were furnished.

The tube-stand was particularly adapted to this work, the main part of the stand and base being of iron and very heavy; the arms holding the tube and wires are of fiber, with an adjustable wooden clamp for the tube. With this stand it is possible to hold the tube in any position from within a few inches of the floor to eight feet above it. The ship also carries about a gross of X-ray plates and a full developing and printing outfit. It is understood that this company is putting out a large number of these static machines, and has several large hospital orders on hand.

Electric Railways in Shanghai, China.

United States Consul-General Goodnow, of Shanghai, under date of July 9, 1898, says: I enclose a clipping from the published report of the proceedings of the City Council with reference to the proposed street railway in Shanghai. This plan contemplates about 18 miles of railway of the overhead trolley system. It appears to me that our electric railway builders should bid for this concession. The extract reads:

The report of the special commission is again under discussion, and it is decided to include in the particulars both systems of gauge "standard" and "meter."

The following general particulars are ordered for publication:

The electric overhead trolley system is to be adopted.

The routes are to be three in number, viz.:

1. From the French waterworks along the Chinese Bund (if practicable), and thence along the French and English Bunds, to a point by way of Broadway, Seward and Yangtzepoo roads.
2. From the Bund to the Bubbling Well, by way of the Kiukiang, Kiangse, Hankau and Nankin roads.
3. From the Shanghai station of the Woosung–Shanghai Railway to the west gate of the Chinese city.

A concession is to be given for the construction of the line and all accessories to a syndicate or company, to be known as the "Shanghai Tramway Company." The concession is to be for 30, 40, or 50 years, according to the tender that the ratepayers may decide to accept, and the company is to pay the council a percentage of the total gross receipts for the period of the concession.

Notification to tenders by public advertisement will follow in due course, and the tender finally selected will be submitted to the ratepayers for ratification.

LITERARY.

The war articles in the September *Scribner's* are led by Richard Harding Davis's account of the Rough Riders' Fight at Guasimas." There is no information at second-hand in this article; Mr. Davis was in the thick of the fight and writes of what he saw. When he crushes, once for all, the story of a surprise, he does it with positive knowledge of the previous orders given and received by General Wheeler and Colonel Wood. The conversations he had with the men in the fight are vivid bits of dramatic dialogue. The whole article is the fullest as well as the most thrilling account of the Guasimas fight yet published, and will stand as the historical picture of that famous event. The illustrations give many of the best known men in the Rough Riders and views of the country over which they fought. There are also drawings from life by the artist, H. C. Christy, who was there.

"Street-Railway Roadbed," by Mason D. Pratt and C. A. Alden. Cloth, 135 pp., 157 illustrations. Price, $2. Sent post free on receipt of price by Electrical Review Publishing Company, Times Building, New York city.

This is a timely work and, we believe, the only book treating especially of street railway roadbed, the conditions of which differ so widely from those of steam-railroad track construction as to justify an exclusive treatise. The experience of the authors in track construction insures a thorough, comprehensive, up-to-date treatment of the subjects discussed. The book not only describes and discusses the different forms of rails, character of track construction and special work, but also instructs the reader as to the proper manner of building track, laying out spiral curves, etc. It also includes valuable tables to aid in this latter work.

Photographing Currents From the Human Body.

Dr. Adrien Guébhard, of St. Vallier-de-Thiey, has published a number of papers dealing with the supposed photographic representation of currents emanating from the human body, concerning which much appears to have been said in France a few months ago, when the subject was brought into prominence by the announced discoveries of Dr. Baraduc and the late Dr. Luys. Briefly told, when a slightly fogged photographic plate is developed in a shallow bath, and the experimenter presses his fingers on the plate during the process, streaks are observed to radiate from the parts touched. So far from the effect being due to "animal magnetism," or any of the other occult influences with which spiritualists are wont to deal, Dr. Guébhard shows that the lines are simply caused by convection currents produced by the warmth of the operator's finger. If for the latter there be substituted a small india-rubber ball filled with warm water, exactly the same impressions are produced. Similar results are obtained with a body cooled below the temperature of the developer, and in each case their intensity is greater the greater the difference of temperature. In some of Dr. Guébhard's figures the lines closely resemble the lines of flow due to sources and sinks, or the lines assumed by iron filings in the presence of magnets. As representations of the lines of flow of convection currents, these figures may interest the physicist.—*Nature.*

Theory of Hearing Suggested by the Telephone.

BY WILLIAM RUTHERFORD, M. D., F. R. S., IN "THE LANCET," LONDON.

Eighteen years ago (1880) while thinking over the great difficulties that beset the resonance theory it occurred to me that the telephone might by analogy help us to better understand the action of the cochlea. The telephone transforms sound vibrations, however complex, into electrical currents of corresponding frequency, amplitude and wave form, and these in turn are retransformed into sound vibrations similar to those received. The theory of hearing which I was led to propose is that there may be no analysis of sound in the cochlea; that all the hair cells may be affected by every sound, simple or complex, and through them the sound waves translated into nerve vibrations of corresponding frequency, amplitude and wave form; that in the sensorium the nerve vibrations give rise to sensations varying in quality with that of the incoming impulses. My theory has been termed the telephone theory of hearing, and no doubt it is a convenient term to distinguish it from the resonance theory, but I wish it to be understood that I never regarded the hair cells as transforming the mechanical vibrations of sound into an entirely different mode of motion analogous to electricity. The essential point in my theory is simply this, that there is no analysis of sound waves in the cochlea. Theoretically a single hair cell, nerve fiber and sensory cell should suffice to give us all the different sound sensations; but probably the great number of auditory terminals and sensory cells renders us far better able to feel slight differences in the quality of sounds. My theory of tone sensation has the advantage of carrying the physical cause of harmony into the auditory center, and the validity of the argument I advanced in 1886 was afterwards proved by Hermann by experiments on the production of differential tones. When two discordant tones are simultaneously produced a beat is heard, and if the vibrational difference between the two primary tones be sufficiently great the successive beats give rise to the sensation of a third tone, whose pitch is the vibrational difference between the two primary tones; for example, if the primary tones have respectively 880 and 1,056 simple vibrations, the pitch of the beat tone is 176 simple vibrations; namely, the note F.

Hermann produced the two primary tones from two tuning forks, with a third fork at rest, but capable of consonating to the beat-note if it had been produced objectively, but the third fork remained unaffected, although the observer heard the beat-tone loudly. He therefore concluded that if the beat-tone failed to excite a resonator outside the ear it could not affect any supposed resonator in the cochlea; consequently it must be a purely subjective phenomenon arising from the conflict of vibrations in the auditory center. That experiment, which has been fully confirmed, proves that the auditory nerve transmits to the sensorium vibrations of the same frequency as the sound waves and that they produce in the auditory center harmony or discord, according to their relative numbers. Hermann's conclusion from these experiments is "that there is no alternative but to drop the Helmholtz hypothesis of resonators in the ear, although so elegant."

Although the telephone theory of the action of the cochlea enables us to understand the productions of sensations of harmony and discord it still leaves much that is in the highest degree obscure. The discrimination of pitch is a great difficulty. We all know that it varies greatly in different persons. Those who have a little or no ear for music have been found unable to observe any difference of pitch between C and E of the scale, although there is an interval of 66 vibrations between them. On the other hand, a musician with an extremely good ear may by practice become so sensitive to pitch that he can detect a difference due to one-fifth of a vibration even when the vibrational frequency is 1,000 per second. That fact is all the more remarkable, because when the vibrational frequency rises above 500 per second we can not detect the individual vibrations, although we can readily feel a change in the sensation. The accurate and refined appreciation of pitch seems therefore to imply an exceptionally perfect molecular state in the cells of the auditory center; but how it is that the consciousness is so sensitive to changes in vibrational frequency when the individual vibrations are no longer perceptible must remain a mystery.

Cambridge, Mass., has asked for an appropriation for the instituting at city hall of a municipal telephone exchange, similar to the one recently opened in the city of Boston.

Development of the New York Telephone System.

The steadily increasing demand for telephone service in the central and upper districts of Manhattan has led the New York Telephone Company to plan important additions to its plant in the portion of the city lying between Twenty-third street and the Harlem River. These additions comprise three new telephone buildings, two to form the centers of new exchange districts and one to replace an existing exchange. Besides the erection and equipment of these buildings, additional accommodations for subscribers will be made at the Harlem exchange by rearranging the lay-out of the new telephone building at 124th street, so as to greatly enlarge the operating-room space.

The three new exchanges will be situated: One on East Twenty-ninth street, near Madison avenue; one at Seventy-ninth street and Third avenue, and one on Eighty-ninth street, near Columbus avenue. The exchange on East Twenty-ninth street, which will receive a geographical name not yet decided on, will serve a district taken partly from that of the Eighteenth street exchange (at Eighteenth street and Broadway) and partly from that of the Thirty eighth street exchange (at West Thirty-eighth street, between Broadway and Sixth avenue). "Seventy-ninth" will replace the present Seventy-ninth street exchange, at Seventy-ninth street and Third avenue, now in quarters occupying several floors of an apartment house, which have become inadequate to the growing demands of the service. The exchange at West Eighty-ninth street will be known as "Riverside," and will be the first of the three new offices to be put into service. Hitherto there has been no telephone exchange on the west side of the park, the district being served at present from "Columbus," at Fifty-eighth street and Columbus avenue. The new exchange will serve an important and growing residential district.

The three new buildings will each occupy a ground space of about 25 by 70 feet, and will have three stories. They are designed exclusively for telephone purposes, and will contain the most advanced and complete equipment for telephone exchange accommodation, embodying all the improvements and modifications that experience with other similar buildings has suggested to the engineering staff of the New York Telephone Company.

At the Harlem exchange the arrangement of space is being overhauled so as to provide one entire floor 35 by 100 feet for operating-room purposes. The operating-room and the operators' quarters have hitherto been on the same floor and the changes involve the removal of the latter department to another floor.

The new equipment under construction for the Harlem exchange will be the latest and most improved production for telephone exchange working. The switchboard is of the type known as the relay common battery board, in which the calling and clearing-out signals are made, not by drops, but by incandescent lamps. The lamps are lighted by the movements of the automatic switch on the subscriber's set, thus doing away with the magneto-generator now used for sending in a call or a ring-off signal.

In the new system the subscriber, by the act of lifting the receiver off the hook, lights a lamp which signifies that he has made a call, and when he replaces the receiver or otherwise depresses the hook another lamp is lighted to signify the order for disconnection. The new Eighty-ninth street exchange will also be equipped with the common battery system and in due course the new devices for adding to the speed and simplicity of the telephone service will be adopted in the other exchanges. It is naturally impossible to change the entire equipment of a dozen large telephone exchanges, and of over 20,000 subscribers' stations in a day, but the work of bringing the whole system up to the topmost notch of telephonic improvement will be carried out steadily and gradually, without interference with the service, just as other similar changes have been effected in the past.

The quarterly report of the Syracuse, N. Y., Rapid Transit Railway Company for the quarter ended June 30 shows: Gross earnings, $112,623; operating expenses, $72,295; other income, $785; fixed charges, $44,819; deficit, $3,706; for like quarter of 1897, $4,293. These companies filed annual reports: Rome City Street Railway — Gross earnings, $4,986; operating expenses, $5,834; loss, $848; other income, $262; fixed charges, $130; net loss, $715; total deficit to June 30, 1898, $1,698. The Newburg Electric—Gross earnings, $83,-255; operating expenses, $49,214; other income, $622; fixed charges, $36,598; deficit, $1,935; total deficit to June 30, 1898, $4,920.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

BROWNING, WASH.—A telephone line between this place and Durham, on the Great Northern, has been completed by J. H. Sherburne.

NEWTON, KAS. — A. R. Champlin, manager of the Newton Telephone Company, has decided to build a long-distance telephone line from this city to Moundridge. This will give Newton connections with Salina, as a telephone line extends from Moundridge to Salina.

The Missouri & Kansas Telephone Company has a long-distance line connecting this city with Hutchinson, Wichita, Winfield and Arkansas City and a number of smaller towns.

SAGINAW, MICH.—The Bell Telephone Company has a force of men at work constructing a line of wire from here to Farwell. The line is already completed as far as Midland.

OLD TOWN, ME —The New England Telephone and Telegraph Company is to extend its line from this place to Lincoln.

MANKATO, MINN.—Arrangements are under way to connect this city with Blue Earth City by telephone.

BARABOO, WIS.—The Badger State Long Distance Telephone Company, organized in this city a few months ago, has completed its line from this place to Kilbourn, a distance of 14 miles.

MANSFIELD, OHIO—The Farmers' Co-operative Telephone Company has been incorporated, to build and operate a telephone line in Ashland, Richland, Holmes, Wayne, Knox, Morrow, Crawford, Seneca, Huron, Lorain, Medina, Erie, Marion, Cuyahoga, Sandusky, Wyandotte, Delaware and Licking counties; capital stock is $10,000. Incorporators: H. T. Manner, M. F. Mowery, W. W. Darling, W. A. Wallace and N. C. Manner.

WICHITA, KAS. — The Western Union Telegraph Company has begun the construction of a new line from this place to Coffeyville, taking in the towns of Winfield, Wellington, Caldwell and Arkansas City.

CLEVELAND, OHIO — The Union Suburban Telephone and Telegraph Company has been incorporated. It will establish a line from Painesville to Sandusky, with branches all over Ohio and into other states. Among the incorporators are J. B. Hanna, brother of the Senator, and H. A. Everett, the street car man; capital stock, $1,000,000.

PROVIDENCE, KY.—J. T. Alexander, of Madisonville, will establish a telephone exchange at this place.

WAYNESBORO, GA.—John D. Esterlin may be addressed concerning contemplated establishment of a telephone exchange.

MADISONVILLE, KY.—Mr. Nixon is endeavoring to establish a telephone system for the Cumberland Telephone Company.

AMARILLO, TEX.—T. F. Moore & Company have received contract to construct a telephone line from this place to Roswell, N. M.

ROBY, TEX.—Hughey, Green & McCrea have purchased the Roby & Sweetwater telephone system, and will immediately extend it to a connection with Abilene and other points.

LIVE OAK, FLA.—Dr. Boatwright and others have been granted charter for the erection, equipment and operation of a telephone system.

CHESTER, ILL.—Gordon Telephone Company has been incorporated, to conduct telephones; capital stock, $5,000.

New Electric Railways.

COLUMBUS, OHIO — The Rapid Transit Company, running from Springfield to Xenia, has changed its charter so as to extend the line to Dayton.

BAY CITY, MICH.—Plans are on foot for the construction of an electric street-car line from this city to Flint via Saginaw.

DEFIANCE, OHIO—The project to construct an electric railway connecting this city with Evansport, Bryan and Montpelier is again being revived. The work of securing the franchise and right of way will be commenced in a few days.

WATERTOWN, N. Y.—William P. Casey, of Syracuse, organized a company to build and operate a trolley line between this place and Sackets Harbor. The amount of capital stock is $100,000. The directors for the first year are as follows: William P. Casey, James S. Luddington, James H. Kinney, H. D Barto, Syracuse; Joseph Marrian, G. Harrison Smith, John E. Bergevin, Watertown; S. Harland Wetmore, Leyden; William H. Reese, Evans Mills. The stockholders and incorporators are William P. Casey, James L. Luddington, James H. Kinney and H. D. Barto, of Syracuse; G. Harrison Smith, Joseph Marrian, Wilbur F. Porter, Amelia E. Barron, D'Esting Moore, John E. Bergevin, Ora E. Riordan, Norris M. Van Brunt and Edward Cuff, of Watertown; S. Harland Wetmore, of Leyden, Lewis County, and William H. Reese, of Evans Mills.

FARMINGTON, MO.—Articles of incorporation have been granted to the Lead Belt Railroad Company, which will be built from Central Station, on the Bonne Terre & Mississippi Railway, to the Central lead mine, a distance of four miles. The incorporators are J. H. Bethune, H. J. Cantwell, W. T. Gould and other St. Louis men.

EAST ST. LOUIS, ILL.—The Illinois Central is going to put into operation an electric line between this place and Belleville, Ill., on the third-rail system.

GAINESVILLE, TEX.—The Gainesville Park Street Railway Company has been incorporated by J. M. Lindsay, Lewis Lindsay and others; capital stock, $100,000.

NEWPORT NEWS, VA.—The Newport News & Old Point Railway Company has been granted a franchise for the construction of an electric light and power plant.

Electric Light and Power.

FRANKFORT, KY.—The state officers are taking steps to construct an electric plant to light the state buildings. They are preparing to utilize $3,000 appropriated by the last session to erect the machinery and motor power at the penitentiary.

LEE, MASS.—The electric light company will put in 160 lights in the South Lee paper mill.

OCALA, FLA. —The Mayor may give information concerning $15,000 worth of bonds to be issued for improvements to the city electric light plant.

LAUREL, MISS.—The Mayor may be addressed concerning proposed establishment of electric light plant.

ORANGEBURG, S. C.—The Mayor may be addressed concerning proposed construction of electric light plant.

DICKSON, TENN.—The Business Men's League may be addressed concerning proposed establishment of electric light plant.

HOUSTON, TEX.—An electric light plant will be established below the San Jacinto bridge.

ABILENE, KAS.—An electric light plant will be established.

YOUNGSTOWN, N. Y.—A. J. Lewis and son have been awarded the contract for erecting the light station on Carlton Island, and will commence the work as soon as possible.

BELOIT, N. Y.—Work has been commenced for the erection of an electric plant at this place, to be run between this place and Lowville.

New Incorporations.

CAMDEN, N. J. — The Clark-McGaillard Engine Company has been incorporated. The objects of the company are to construct complete steam and electric plants. The capital stock is $100,000. The corporators are Chauncey C. Clark, John W. Stoy and Charles P. Watson.

CHICAGO, ILL. — John Kammer Company has been incorporated to manufacture electrical appliances; capital stock, $50,000.

ATLANTA, GA. — A company has been organized by northern and southern capitalists, to construct and operate telephones, electric lights and railways in southern states.

CHEBOYGAN, WIS. — Wisconsin Storage, Electric and Water Company, of Plymouth, Wis., has been incorporated, with a capital stock of $25,000.

NEW YORK, N. Y.—H. W. & M. Electric Company has been incorporated by Charles Hagedorn and others; capital stock, $25,000.

PORTLAND, ME.—The Universal Electric Clock Company has been organized for the purpose of the manufacture and sale of electric clocks and other articles, with $150,000 capital stock. The officers are: President, Frederick Richard, of Boston; treasurer, Theodore Lentz, of Boston.

Business Troubles

CHICAGO, ILL.—Standard Light and Power Company; John M. Scott has been appointed receiver; assets, $50,000; liabilities, $18,000.

Three-Phase Apparatus in Manchester, Eng.

It is reported that the corporation of Manchester, Eng., has lately placed a large order for three-phase machinery with Messrs. Thomas Richardson & Sons, of Hartlepool, and Messrs. Brown, Boveri & Company, of Baden, Switzerland. The order comprises rotary converters of an aggregate capacity of 1,200 units, with three-phase static transformers of the same output, and also the necessary high and low-tension switchboards for the control and regulation of the above. This machinery is required for the supply of electrical energy from the municipal electric lighting Station in Dickinson street to various outlying urban districts. Continuous current will be taken from the omnibus bars of the central station switchboard, and transformed by means of the rotary and static transformers to three-phase current at a tension of 5,000 volts. This will be distributed by means of high-tension triple-conductor cables to the different substations, where it will be again converted into continuous current, and be distributed to the consumers on the three-wire system, with 400 volts between the outers.

The annual statement of the Butte, Mont., General Electric Company has been filed. It is signed by H. M. Byllesby, president, and H. M. Turner, secretary. It shows that the company is capitalized for $600,000, of which $25,000 has been paid in in money and $575,000 is represented in property, consisting of electric light plant, engines, boilers, dynamos, poles, etc. The cash value of the assets is $611,000. The liabilities are: First mortgage bonds, $421,000; second mortgage, $3,000. The bills payable are $100,000, and the floating debt is $9,456.44.

We have received from Librairie Gauthier-Villars "Distribution de l'Énergie par Courants Polyphasés," by J. Rodet.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 30, 1898.

609,851 Electric Locomotion; H. Van Hoevenbergh, New York, N. Y.—A system of electric locomotion, comprising a supply-conductor extending along a roadway, and a series of trolleys supported thereon for leading current to road vehicles, said trolleys being provided with sloping frames to permit transit over one another and a flexible conductor connected with a traveling vehicle whereby the trolleys may rest by gravity on the supply-conductors.

609,875 Electrode for medical purposes; M. N. Clarke, Wilkesbarre, Pa.—A suitable source of electricity and a pair of electrodes consisting of suitably shaped metal plates filled with small perforations.

609,877 Tension regulator for electrical transmission of speech; A. C. Cousins, Newark, N. J.—The herein described method of transmitting sound, which consists in subjecting to the action of the transmitting current a substance from which is thereby generated a gaseous variable resistance medium, and varying the resistance of said gaseous medium by the action of and to conform to the sound-waves to be transmitted.

609,888 Clamp for electric wires; S. S. Leonard, Chicago, Ill.

609,924 Incandescent lamp shade or cover; W. H. Wells, Brasher Falls, N. Y.

609,972 Hanger for electric lamps; W. F. Murphy, Iowa City, Iowa—Consists of bracket arms, metallic spindles connected with and extending inwardly from the bracket arms, and adapted to be electrically connected with the opposite poles of an electric generator, the spool or drum having metallic bushings in its opposite ends snugly receiving the spindles, wires wound on the spool and adapted to be connected with an electrical device, metallic screws connecting the wires to the spool or drum and impinging against the bushings thereof, suitable means for rotating the spool to wind the wires thereon, and suitable means for normally holding the spool against rotation.

609,977 Electric railway motor; A. Schmid, Pittsburgh, Pa.—Consists of an armature, a field magnet constructed in two sections, the upper section being supported by the car-truck and the lower section being hinged to and supported by the upper section and adapted to swing downward.

609,990 Means for controlling non synchronous alternating-current motors; B. G. Lamme, Pittsburgh, Pa.—In a polyphase alternating-current electric motor, the combination with the primary member of a secondary member provided with a comparatively high-resistance winding directly short-circuited on itself, and means for varying the electrotive force applied to the primary member, whereby the speed of the motor is varied.

609,991 Method of and means for securing constant torque in polyphase motors; B. G. Lamme, Pittsburgh, Pa.—An inductive polyphase motor having a comparatively high-resistance secondary winding and small magnetic leakage of choke coils in the external circuit, the cores of which become saturated by a given current whereby a substantially constant torque is secured.

609,994 Counter battery; W. Meyer, Chicago, Ill.—A counter, bushings in perforations in said counter adapted to receive cartridges, spring-pressed rods adapted to explode said cartridges, and means for operating the rods.

610,007 Contact device for electric railways; L. E. Walkins, Springfield, Mass.—Consists of the axles of electric railway cars, a shoe-supporting frame having suspension supports from said axles, and comprising the articulated supporting member, springs interposed between the top of the frame and a portion of the car or its truck thereabove, a wheel centrally carried by the frame and adapted to run on the top of the third-rail conductor, and a shoe having a depending support from the frame and adapted to bear yieldingly against a sidewise portion of the third rail.

610,008 Contact-rail appliance for electric railways; L. E. Walkins, Springfield, Mass.

610,009 Electric railway; L. E. Walkins, Springfield, Mass.

610,016 Electric switch; R. A. Baldwin, South Norwalk, Ct.—Consists of an electro-magnet and its armature, a rod attached to and moving with the armature, a guide adapted to deflect the rod when it is moved by the armature, and a switch-moving bar under the control of the guided movement of the rod.

610,023 Automatic cut-out for magneto-generators; W. J. Bowen, Cleveland, Ohio—An automatic cut-out, having a spindle, a loose wheel and an insulating projection rigidly secured to the spindle, a pin-and-slot connection between the wheel and projection, a contact-plate on one of these parts, and a spring arranged to hold the pin in contact with the plate.

610,025 Alternating-current motor; C. S. Bradley, Avon, N. Y.—An electric motor having a primary winding provided with a plurality of branches, one or more of which includes inductance to set up in the primary core a rotary field when connection is made with a single-phase current, and a secondary element, the winding of which is connected with an adjustable phase-leading device.

610,077 Ship's log and registering mechanism; W. H. McCurdy, Boston, Mass.

610,090 Electric railroad; B. C. Seaton, St. Louis, Mo.

610,091 Third rail for electric railways; B. C. Seaton, St. Louis, Mo.—A third rail formed with a channel in the upper side to receive feed-in wires.

610,092 Contact device for electric railways; B. C. Seaton, St. Louis, Mo.

610,093 Third rail for electric railways; B. C. Seaton, St. Louis, Mo.—A conductor having a vertical flange, providing an exposed surface for the contact-shoes; and a lateral flange, providing a guard for the contact-shoes.

610,094 Electric railway; B. C. Seaton, St. Louis, Mo.

610,124 Controller for electric motors; H. P. Davis, Pittsburgh, Pa.

Site suitable for Power-House or similar use to lease for long term of years. Ground 84x84, within one block of BROADWAY, NEW YORK. Fronting on three streets, more ground adjoining could be acquired. Is high and dry, permitting basement thirty feet deep. Basement could also run under sidewalks of all three fronts. Apply to

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Kindred.... ...Interests

The Western Electric Company has just issued a bulletin devoted to its station instruments, including arc ammeter current direction indicator, voltmeter and ammeter. Prices and illustrated descriptions are presented.

The Western Electric Company, Chicago and New York, has issued a bulletin, entitled "Arc Lighting, Arc Lamps and Accessories," illustrating and describing the different classes and types of arc lamps manufactured by them.

The National Conduit and Cable Company, Times Building, New York city, is sending to its customers and friends a calendar pad blotter, carrying an attractive announcement of this company's well known paper-insulated cables and cement-lined wrought iron conduits.

The Electrical Supply Company, of Sioux City, has doubled its capital. Mr. E. C. Spalding has been elected treasurer and purchasing agent. Mr. H. O. Woodruff has taken a position on the road. This company has had a good business, and now, with ample capital, it is going to push both jobbing and construction work.

The Columbia Incandescent Lamp Company, of St. Louis, report that business has been most satisfactory with them during the Summer months. The prospects for a greatly increased Fall and Winter trade are very bright. This lamp company is most widely known and the quality of its goods famous wherever incandescent lamps are used.

A comprehensive catalogue of electric bells, electric gas lighting, telegraph and speaking tube supplies has recently been issued by Messrs. Frank H. Stewart & Company, 35 North Seventh street, Philadelphia. The catalogue is a large one and is complete in illustrations, prices and data necessary to intelligent buyers. It will be sent free on application.

While iron and steel armored conduit is being used to the exclusion of almost everything else in new conduit work, there is nevertheless a great deal of work where iron armored conduit can not be used. The most satisfactory substitute under such circumstances is claimed to be "Canvasite" flexible conduit. This is particularly useful in wiring or rewiring old buildings. The Electric Appliance Company, Chicago, are carrying "Canvasite" flexible conduit in all sizes, from one-quarter inch to one and one-quarter inch, and find that it has a ready sale for the above-mentioned uses.

The estate of C. M. Robertson, Montville, Ct., recently lost by fire their boiler-house. In order to obviate, if possible, a like experience in the future, they have decided to put up a thoroughly fireproof construction in its place. The building will have steel framework, brick side walls, and an absolutely fireproof roof, consisting of corrugated iron covering laid on the Berlin Iron Bridge Company's patent anti-condensation roof lining. Steel trusses will support the roof. The building is about 50 feet square, divided by a corrugated iron partition through the center, making a boiler-room and pump-room. The ventilation is obtained by monitors on the ridge of the roof, having sash on the sides. The Berlin Iron Bridge Company are furnishing and erecting the steel work.

Sanderson & Porter, contractors for the Meriden & Compounce, Ct., Electric Railroad Company, have let the contract for furnishing several bridges and buildings on the line of this road to the Berlin Iron Bridge Company, of East Berlin, Ct. The work consists of seven spans of bridges, varying in length from 10 feet to 65 feet, a car barn 50 feet wide and 100 feet long, and a power-house 45 feet wide and 75 feet long. The bridges are of steel, and the buildings have steel frame work, brick side walls and fireproof roofs. The roof of the power-house is covered with corrugated iron and lined with the Berlin Iron Bridge Company's patent anti-condensation roof lining. This lining has shown itself efficient in preventing condensation and moisture from the under side of covering and doing away with the danger and annoyance of water dripping on the expensive and delicate machinery below.

M. C. Bullock Manufacturing Company, the well known machinery supply house, 1170 West Lake street, Chicago, write as follows:

We are pleased to report the past 60 days as a busy period. Orders for diamond drill supplies from the North and Northwest are strong indications of activity attendant upon development work and forecast a large business to houses furnishing supplies to this line.

Rock drills for mining purposes are always in demand, but just now there is an increased call which augurs well for the future, and we have placed a number of Monarch drills in entirely new fields.

Though foreign orders have generally been withheld during the war, we have received orders for four refrigerator plants and the promise of others. Orders have also been received for two central-valve engines, to be direct-coupled to dynamos, one for lighting and the other for power transmission.

With a goodly number of orders on hand and more promised, the business outlook from our point of view is encouraging, and we are preparing our works and force to meet a heavy demand for the various lines of our manufacture.

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The City of Huntington, W. Va., will, on October 1, 1898, let the contract for lighting the City of Huntington with 75 arc lights of 2,000 c. p. to burn all night and every night. Two bids wanted; one for five years, one for ten years. City to furnish one side of all streets for placing poles, lines, etc. The City Council reserves the right to reject any or all bids.

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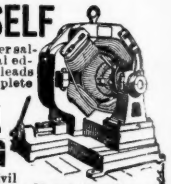

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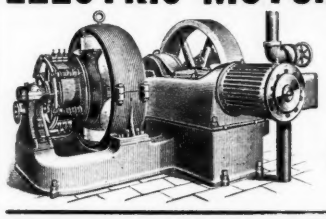

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